



***Montana Fish,
Wildlife & Parks***

**2014 Report on
Aquatic Invasive Species Monitoring**

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The Montana Fish, Wildlife & Parks (FWP) Aquatic Invasive Species (AIS) Program works to implement the AIS Management Plan through coordination and collaboration, prevention of new AIS introductions, early detection and monitoring, control and eradication, and outreach and education. The goal of the AIS Management Plan is to minimize the harmful impacts of AIS through the prevention and management of AIS into, within and from Montana. The report for the Early Detection and Monitoring program for 2014 follows.

Early Detection and Monitoring – Background

Montana's Aquatic Invasive Species (AIS) early detection and monitoring program has been in place since 2004. Early detection allows Montana Fish, Wildlife & Parks (FWP) biologists to locate small or source AIS populations, while monitoring allows FWP to study current population trends. FWP monitors for all aquatic invasive species, including, but not limited to: zebra/quagga mussels (ZM/QM), New Zealand mudsnails (NZMS), and Eurasian watermilfoil (EWM). Plankton sampling for ZM, QM, and Asian clam veligers (microscopic larvae) has increased each year, in part due to an increase in volunteer sampling efforts. To aid in AIS monitoring, FWP employees – including fish health staff and regional biologists – have been given training in AIS species identification. FWP staff are often sampling high risk waters for other purposes, and additional AIS sampling increases overall efforts with less travel cost for AIS staff in Helena. Overall monitoring and early detection efforts have increased steadily over the years.

Methods

FWP assesses the risk for AIS introductions to waterbodies annually. Variables used in determining risk are constantly evolving. Sites are prioritized based upon the previous years' work conducted by FWP, available calcium and water quality data, angler/boater pressure, boater movement data from watercraft inspection stations, monitoring conducted by other state and federal agencies, surface-water hydrology of the system, and other assorted variables.

Montana utilizes a variety of techniques in monitoring for AIS species. Plankton sampling involves the collection of microscopic organisms in the water column using specialized, fine mesh nets and analyzing those samples at the FWP Dreissenid lab in Helena. Cross-polarized light microscopy is the method utilized by the lab to detect the larvae (veligers) of invasive bivalves such as zebra mussels and Asian clams. Invertebrate sampling involves the use of kick nets and rock picking to search for invasive species while identifying native species and noting population densities. Polymerase Chain Reaction (PCR) testing or the amplification of environmental deoxyribonucleic acid (eDNA) is used as a confirmation of microscopy findings for verification, if necessary. Fish pathogens, such as whirling disease, are considered AIS and therefore FWP conducts pathogen testing in fish in conjunction with other AIS monitoring. All

of Montana's monitoring protocols have been scientifically reviewed, are updated annually, and are coordinated with neighboring states.

The movement of fish could also be a substantial vector for transferring AIS. FWP moves large numbers of fish through both its hatchery and wild fish transfer programs. Montana inspects all federal, state and commercial hatcheries annually as well as source waterbodies for any wild fish transfer. These AIS inspections include both on-site AIS surveys and disease/pathogen testing in fish. Hatcheries cannot receive certification to sell or move fish without passing an AIS inspection.

It is the policy of the FWP AIS program to monitor for all aquatic invasive species taxa whenever possible. While multiple other agencies and organizations assist in monitoring throughout the state (usually with plankton sampling), FWP routinely monitors for all taxa while conducting standard monitoring.

FWP has always sampled for macrophytes, but focused on point-intercept sampling unless assisting MDA with more in-depth plant mapping. In 2013, FWP integrated MDA's plant specialist into its AIS program and began performing comprehensive aquatic plant sampling in select water bodies throughout the state to locate or confirm aquatic invasive plant populations. Sampling occurs from early summer until plants begin to die off with colder water temperatures. Typically, sampling occurs from June to October though sampling dates can fluctuate with temperatures and spring runoff. While sampling, FWP notes presence of all aquatic plants and identifies them to species when feasible. Sampling protocols include littoral point sampling, point-intercept sampling, and sampling entire stretches of rivers focusing on dispositional areas where plants would settle and establish.

2014 Results

In 2014, a total of 187 waterbodies, 456 unique sites and 616 total sites were inspected in Montana. **No new populations of AIS were found in 2014 by FWP.** Table 1 on page 7 provides a complete listing of 2014 monitoring locations which includes AIS species observed as well as sites where no AIS were detected. Note that this table only shows the results for 2014 monitoring conducted by FWP, not previous years' results or results from surveys conducted by other agencies or organizations. Findings in 2014 include the following:

- New Zealand mudsnails continue to persist at Darlington Ditch, Hauser Lake, Nelson's Spring Creek, Bluewater Creek, and on the Missouri River below Holter Dam.
- No adult populations of ZM/QM or Asian clams were detected this year or in previous years on Montana waters.

- No zebra/quagga mussel or Asian clam (*Dreissena spp.* or *Corbicula spp.*, respectively) veligers were detected in the plankton samples processed by the FWP Dreissenid Lab in Helena in 2014 or in previous years for Montana waters.
- Eurasian watermilfoil continues to persist at Fort Peck Reservoir, Noxon Rapids Reservoir, Cabinet Gorge Reservoir, Jefferson River, and the upper Missouri River.
- Gallatin County Extension located several points of Eurasian watermilfoil on the extreme lower reaches of the Madison River while surveying for aquatic invasive plants through a grant with DNRC. These points are located within highly braided areas that have at a minimum seasonal connectivity with the Jefferson River prior to the actual confluence of both rivers. As such, it is not surprising that Eurasian watermilfoil was found at these sites.
- Curly leaf pondweed remains on the Bitterroot River, Canyon Ferry Reservoir, Hauser Lake, Holter Lake, Ennis Lake, Hebgen Lake, Missouri River, Clark Fork River, and Post Creek.

Figure 1 illustrates AIS monitoring sites over the past nine years, while Figure 2 illustrates sites monitored in 2014. All high risk sites are inspected annually at a minimum, while lower risk sites are surveyed less frequently. The program goal is to comprehensively monitor the state every year, and all types of waterbodies (lakes, reservoirs, ponds, creeks, rivers, etc.) are included. This statewide emphasis is illustrated in Figures 1 and 2.

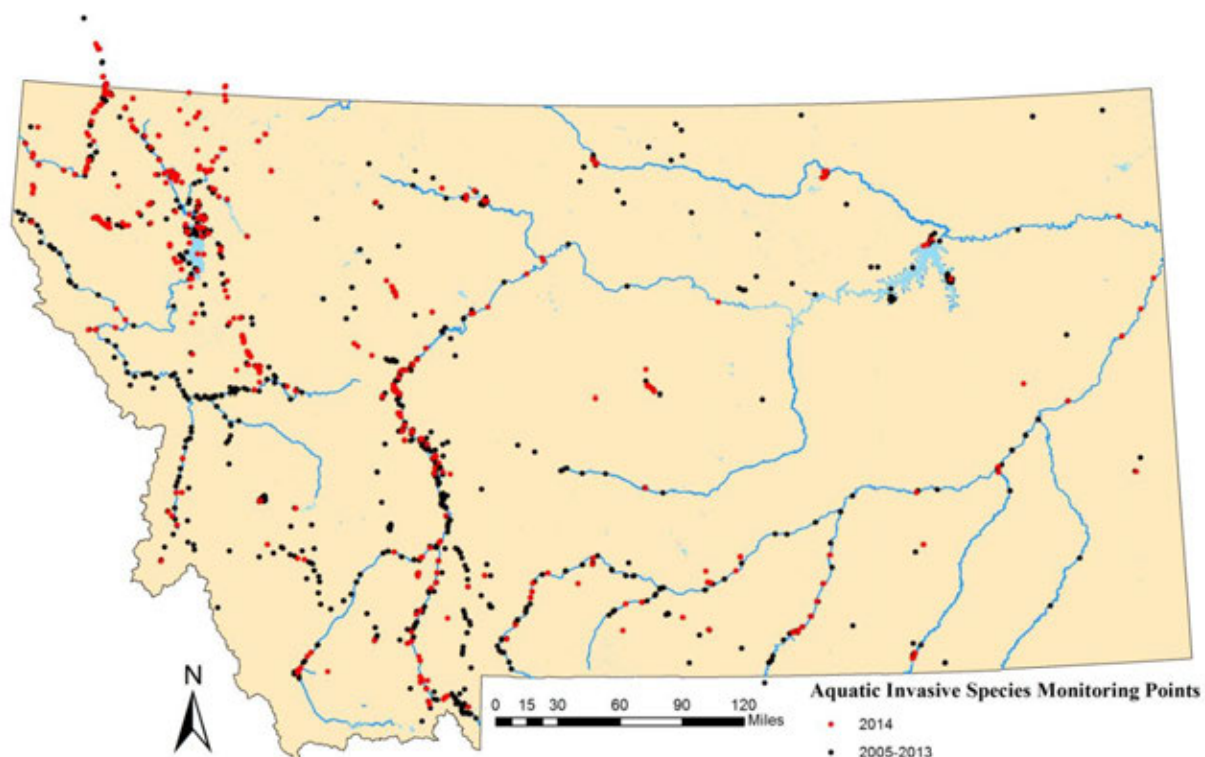


Figure 1: Map of AIS sampling locations, 2005-2014

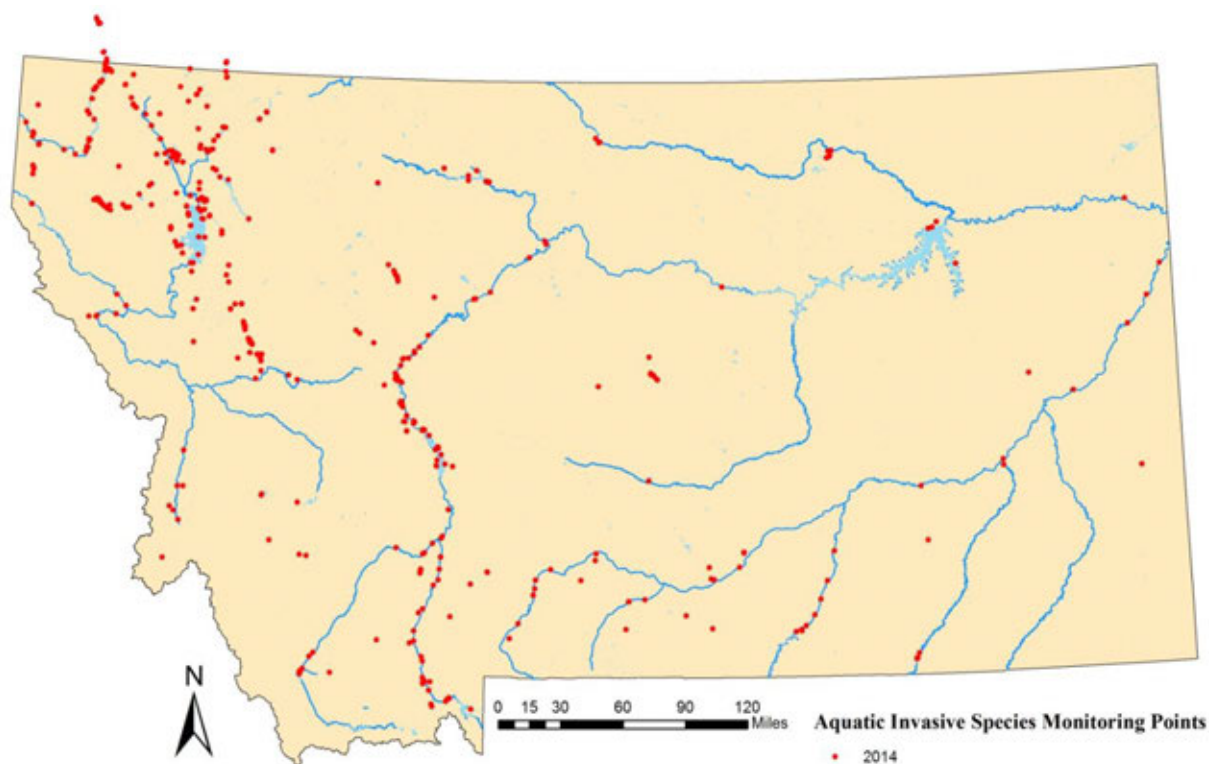


Figure 2: Map of AIS Sampling Locations, 2014

Figure 3 illustrates trends in AIS monitoring over the past nine years. Numerous variables contributed to the fluctuations in the data. The 2005 field season was hot and dry; therefore the sampling season was extended. Funding and staff was limited until 2009 when monitoring expanded. In 2010 and 2011, volunteer efforts were substantially increased by private organizations and other state and federal agencies concerned about the potential introduction of Dreissenid mussels. However, these years had short field seasons due to high water levels and cold water temperatures late into the summer. The 2012 and 2013 field seasons yielded more average flows and an increase in staff; however, monitoring was delayed due to the opening of multiple new watercraft inspection stations. The 2014 field season was similar to that in previous years with average flows and temperatures and watercraft inspection station efforts taking priority in the early part of the season. Efforts were again augmented by volunteers and contractors.

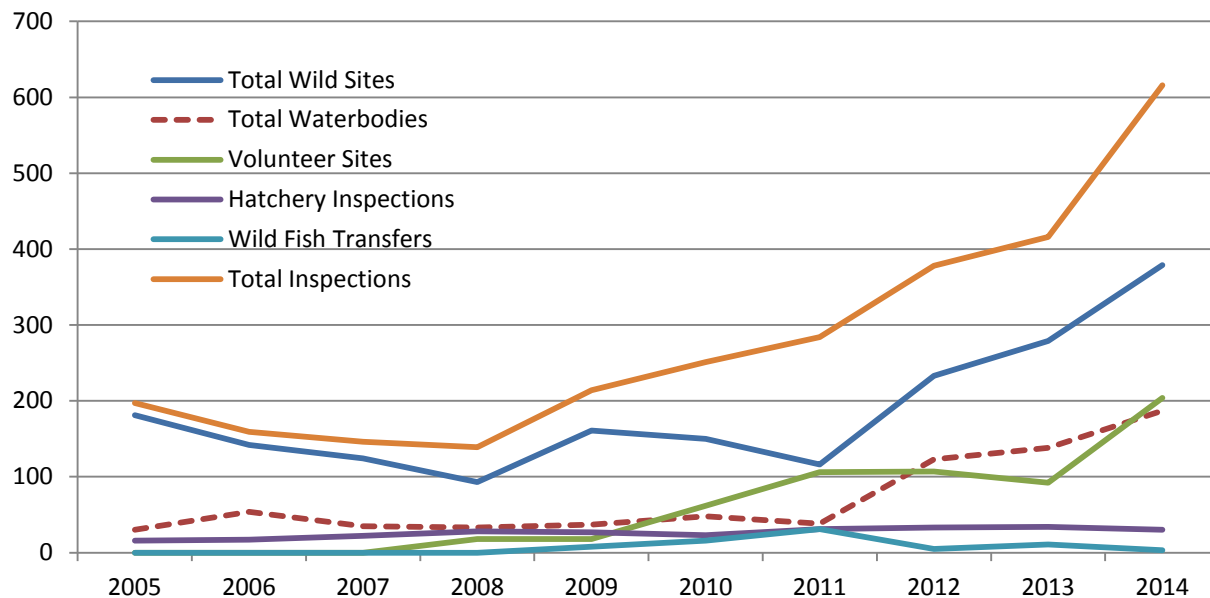


Figure 3: Annual AIS Monitoring (2005-2014)

Aquatic Plant Sampling

FWP selected water bodies that were suspect to contain AIS, high risk, or locations needing confirmation of AIS. In all, FWP crews surveyed 38 water bodies. Table 1 shows the locations of FWP sampling for aquatic invasive plants. No new locations of Eurasian watermilfoil, curlyleaf pondweed, flowering rush, or fragrant waterlily were detected during these targeted surveys.

Table 1. 2013 Aquatic plant sampling locations

Water Body	County	Sampling Type	Sampling Days	Sampling Points	Findings
Bear Paw Reservoir	Hill	Littoral point	1	41	No Aquatic Invasive Macrophytes detected
Bull Lake	Lincoln	Point-Intercept	2	180	No Aquatic Invasive Macrophytes detected
Canyon Ferry Delta (river left)	Broadwater	Littoral point	3	596	Mapped locations of Eurasian watermilfoil and curlyleaf pondweed
Canyon Ferry Reservoir	Broadwater/ Lewis & Clark	Littoral point	5	606	No Aquatic Invasive Macrophytes detected above known Eurasian watermilfoil populations
Freezeout Lake Complex - Main Lake	Teton	Littoral point	0.5	118	No Aquatic Invasive Macrophytes detected
Freezeout Lake Complex - Pond 1	Teton	Littoral point	0.5	35	No Aquatic Invasive Macrophytes Detected
Freezeout Lake Complex - Pond 2	Teton	Littoral point	0.25	7	No Aquatic Invasive Macrophytes Detected
Freezeout Lake Complex - Pond 3	Teton	Littoral point	0.5	46	No Aquatic Invasive Macrophytes Detected
Freezeout Lake Complex - Pond 5	Teton	Littoral point	0.25	28	No Aquatic Invasive Macrophytes Detected
Freezeout Lake Complex - Pond 6	Teton	Littoral point	0.25	6	No Aquatic Invasive Macrophytes Detected

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Water Body	County	Sampling Type	Sampling Days	Sampling Points	Findings
Freezeout Lake Complex - Priest Butte Lake	Teton	Littoral point	0.5	24	No Aquatic Invasive Macrophytes Detected
Hauser Lake	Lewis & Clark	Littoral point	1.5	48	Curlyleaf pondweed
Helena Valley Regulating Reservoir	Lewis & Clark	Point-Intercept	1	38	Curlyleaf pondweed
Holter Lake	Lewis & Clark	Point-Intercept	2	189	Curlyleaf pondweed
Jefferson River (below Cardwell)	Jefferson/Madison/Gallatin	Littoral point	4	690	Mapped locations of Eurasian watermilfoil and curlyleaf pondweed
Jefferson Slough	Jefferson	Littoral point	2	375	Mapped locations of Eurasian watermilfoil
Lake Alvord	Lincoln	Point-Intercept	1	54	No Aquatic Invasive Macrophytes Detected
Lake Elmo	Yellowstone	Point-Intercept	0.5	23	No Aquatic Invasive Macrophytes Detected
Lake Helena	Lewis & Clark	Point-Intercept	1	70	Curlyleaf pondweed
Lake Josephine	Yellowstone	Point-Intercept	0.5	23	No Aquatic Invasive Macrophytes Detected
Laurel Pond	Yellowstone	Point-Intercept	0.5	24	No Aquatic Invasive Macrophytes Detected
Lower Thompson Lake (Chain of Lakes)	Lincoln/Sanders	Point-Intercept	1	72	No Aquatic Invasive Macrophytes Detected
Middle Thompson Lake (Chain of Lakes)	Lincoln	Point-Intercept	1	82	No Aquatic Invasive Macrophytes Detected
Missouri River (Below Toston)	Broadwater	Point-Intercept	1	276	Eurasian watermilfoil and curlyleaf pondweed
Nelson Reservoir	Phillips	Point-Intercept	2	293	No Aquatic Invasive Macrophytes Detected
Pond 1 - Canyon Ferry	Broadwater	Littoral point	0.5	40	No Aquatic Invasive Macrophytes Detected
Pond 2 - Canyon Ferry	Broadwater	Littoral point	0.5	38	No Aquatic Invasive Macrophytes Detected
Pond 3 - Canyon Ferry	Broadwater	Littoral point	0.5	44	No Aquatic Invasive Macrophytes Detected
Pond 4 - Canyon Ferry	Broadwater	Littoral point	1	48	Eurasian watermilfoil and curlyleaf pondweed
Quake Lake	Madison/Gallatin	Littoral point	1	59	No Aquatic Invasive Macrophytes Detected
Sacajawea Lagoon	Park	Point-Intercept	0.5	21	No Aquatic Invasive Macrophytes Detected
Savage Lake	Lincoln	Point-Intercept	1	48	Fragrant waterlily
Stillwater River	Stillwater	Littoral point	2	293	No Aquatic Invasive Macrophytes Detected
Toston Reservoir	Broadwater	Littoral point	1	63	Eurasian watermilfoil and curlyleaf pondweed
Triangle Pond	Sanders	Point-Intercept	0.5	30	No Aquatic Invasive Macrophytes Detected
Upper Thompson Lake (Chain of Lakes)	Lincoln	Point-Intercept	1	99	No Aquatic Invasive Macrophytes Detected
Wayne Edsall Pond (Glen Lake Park)	Gallatin	Point-Intercept	0.5	27	No Aquatic Invasive Macrophytes Detected
Willow Creek Reservoir	Madison	Point-Intercept	1	79	No Aquatic Invasive Macrophytes Detected

Dreissenid Laboratory

The FWP Dreissenid lab is located in Helena, MT. It currently processes plankton samples for the Missouri River Basin, including Kansas, Nebraska, Missouri, North Dakota, South Dakota, Wyoming, and Montana. In 2013, it began processing samples for New Mexico and Colorado as well. It is in Montana's best interest to know what AIS may exist downstream and near its borders, and as such, samples are processed for partner states as an in-kind service. The base funding for this lab is provided by the U.S. Fish and Wildlife Service, and average turnaround time for samples is approximately two weeks. Figures 4 and 5 illustrate the volume of samples handled by the lab each year. The lab has discovered new populations of *Dreissena spp.* veligers as well as *Corbicula sp.* (Asian clam) veligers for multiple downstream states. The lab undergoes routine quality control testing by other states and has participated in a community double-blind round robin study on the reliability of early detection methods (Frischer et al, 2011). **In 2014, no veligers for either genus were found in any Montana water samples (n=515) processed by the FWP Dreissenid lab in Helena.** In out-of-state samples (n=1070), *Corbicula* veligers were found in five samples from two states and Dreissenid veligers were found in four samples from three states.

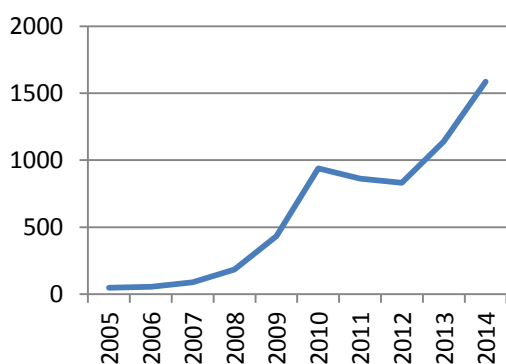


Figure 4: Number of samples processed by lab each year

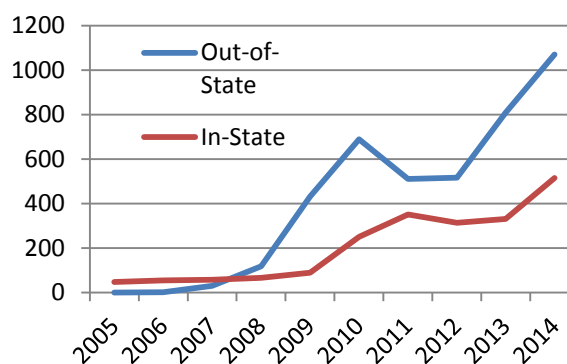


Figure 5: Number of plankton samples processed by lab per year: in state vs. out-of-state

Future Needs

Statewide monitoring efforts by FWP, private sector and government entities are continually improving and expanding. These efforts are critical to the early detection and monitoring of invasive species, and are an important aspect of the AIS program and statewide AIS Management Plan. While these efforts do not guarantee discovery of all AIS species as they are introduced, they do significantly increase the potential to discover new populations before they become established or spread beyond their current boundaries. Limiting the establishment or spread of AIS allows for research to be conducted into control and

eradication methods, and allows for greater efficiency in monitoring and early detection methods. These advances will ultimately save the state time and money protecting its aquatic resources and infrastructure.

Table 2: 2014 FWP AIS Monitoring Locations

Waterbody	Site	Macrophyte Sampling	Invert Sampling	Plankton Sampling	Type	AIS Occurrences
Abbot Lake	1	No	No	Yes	Plankton Only	
Ackley Lake	1	Yes	Yes	Yes	Wild	
Afterbay Reservoir	1	No	No	Yes	Plankton Only	
Alvord Lake	3	Yes*	Yes	Yes	Wild	
Aspen Springs Trout Farm	1	Yes	Yes	Yes	Hatchery	
Banana Lake	1	No	No	Yes	Plankton Only	
Bean Lake	1	Yes	Yes	Yes	Wild	
Bears Paw Lake	1	Yes*	Yes	Yes	Wild	
Beaverhead River	3	Yes	Yes	Yes	Wild	
Big Hole River	3	Yes	Yes	Yes	Wild	
Big Spring Creek	4	Yes	Yes	Yes	Hatchery	
Big Springs Trout Hatchery	2	Yes	Yes	Yes	Hatchery	
Bighorn Lake	1	Yes	Yes	Yes	Wild	
Bighorn River	6	Yes	Yes	Yes	Wild	
Bitterroot Fish Hatchery	1	Yes	Yes	Yes	Hatchery	
Bitterroot River	5	Yes	Yes	Yes	Wild	
Bluewater Springs Trout Hatchery	2	Yes	Yes	Yes	Hatchery	
Bluewater Creek	15	Yes	Yes	Yes	Wild	NZMS
Bootjack Lake	1	No	No	Yes	Plankton Only	
Boulder River	2	Yes	Yes	Yes	Wild	
Brown's Lake	1	Yes	Yes	Yes	Wild	
Bull Lake	5	Yes*	Yes	Yes	Wild	
Cad Lake	1	No	No	Yes	Wild	
Canyon Ferry "Delta"	1	Yes*	No	No	Wild	EWM, CLPW
Canyon Ferry Ponds	1	Yes*	No	No	Wild	EWM, CLPW
Canyon Ferry Reservoir	11	Yes*	Yes	Yes	Wild	
Castle Rock Lake	1	Yes	Yes	Yes	Wild	
Cibid Lake	1	No	No	Yes	Plankton Only	

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Waterbody	Site	Macrophyte Sampling	Invert Sampling	Plankton Sampling	Type	AIS Occurrences
Clark Canyon Reservoir	2	Yes	Yes	Yes	Wild	
Clark Fork River	4	Yes	Yes	Yes	Wild	CLPW
Clearwater River	1	Yes	Yes	Yes	Wild	
Cliff Lake	1	Yes	Yes	Yes	Wild	
Creston National Fish Hatchery	1	Yes	Yes	Yes	Hatchery	
Crystal Lake	1	No	No	Yes	Plankton Only	
Crystal Lakes Hatchery	1	Yes	Yes	Yes	Hatchery	
Dailey Lake	1	No	No	Yes	Plankton Only	
Darlington Ditch	1	Yes	Yes	Yes	Wild	NZMS
Deadman's Basin Reservoir	1	No	No	Yes	Plankton Only	
Dearborn River	2	Yes	Yes	Yes	Wild	
Echo Lake	1	Yes	Yes	Yes	Wild	
Ennis Lake	2	Yes	Yes	Yes	Wild	CLPW
Ennis National Fish Hatchery	1	Yes	Yes	Yes	Hatchery	
Flathead Lake	8	Yes	Yes	Yes	Wild	
Flathead River	1	Yes	Yes	Yes	Wild	
Fort Peck Hatchery	1	Yes	Yes	Yes	Hatchery	
Fort Peck Reservoir	2	Yes	Yes	Yes	Wild	
Freezeout Main Lake	1	Yes*	Yes	Yes	Wild	
Freezeout Ponds	6	Yes*	Yes	Yes	Wild	
Fresno Reservoir	2	Yes	Yes	Yes	Wild	
Gallatin River	1	No	No	Yes	Plankton Only	
Georgetown Lake	3	Yes	Yes	Yes	Wild	
Giant Springs Trout Hatchery	1	Yes	Yes	Yes	Hatchery	
Harriman Trout Co.	1	Yes	Yes	Yes	Hatchery	
Hauser Lake	6	Yes*	Yes	Yes	Wild	NZMS, CLPW
Hebgen Lake	1	No	No	Yes	Plankton Only	
Helena Valley Regulating Reservoir	1	Yes*	Yes	Yes	Wild	
Holland Lake	1	Yes	Yes	Yes	Wild	
Holter Lake	14	Yes*	Yes	Yes	Wild	CLPW
Homestead Reservoir	1	Yes	Yes	Yes	WFT	
Horseshoe Lake	1	No	No	Yes	Plankton Only	
Hungry Horse Reservoir	4	Yes	Yes	Yes	Wild	
J.Luloff Pond	1	Yes	Yes	Yes	Hatchery	

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Waterbody	Site	Macrophyte Sampling	Invert Sampling	Plankton Sampling	Type	AIS Occurrences
Jefferson River	7	Yes*	Yes	Yes	Wild	EWM, CLPW
Jefferson Slough	1	Yes*	Yes	Yes	Wild	EWM
Jocko River Trout Hatchery	1	Yes	Yes	Yes	Hatchery	
J.Beck Pond	1	Yes	Yes	Yes	Hatchery	
Kootenai River	4	Yes	Yes	Yes	Wild	
Lake Alva	1	Yes	Yes	Yes	Wild	
Lake Como	1	Yes	Yes	Yes	Wild	
Lake Elmo	3	Yes*	Yes	Yes	Wild	
Lake Five	2	Yes	Yes	Yes	Wild	
Lake Frances	1	Yes	Yes	Yes	Wild	
Lake Helena	2	Yes*	Yes	Yes	Wild	
Lake Inez	1	Yes	No	Yes	Plankton Only	Fragrant Waterlily
Lake Josephine	2	Yes*	Yes	Yes	Wild	
Lake Koocanusa	33	Yes	Yes	Yes	Wild	
Lake Mary Ronan	1	Yes	Yes	Yes	Wild	
Largent Bend Pond #3	1	Yes	Yes	Yes	WFT	
Laurel Pond	2	Yes*	Yes	Yes	Wild	Goldfish
Lavon Lake	1	No	No	Yes	Plankton Only	
Leon Lake	1	No	No	Yes	Plankton Only	
Lindberg Lake	1	Yes	Yes	Yes	Wild	
Little Loon Lake	1	No	No	Yes	Plankton Only	
Little McGregor Lake	1	Yes	Yes	Yes	Wild	
Little Prickly Pear Creek	1	Yes	Yes	Yes	Wild	
Lower Stillwater Lake	1	Yes	Yes	Yes	Wild	
Lower Thompson Lake	3	Yes*	Yes	Yes	Wild	
Madison River	11	Yes	Yes	Yes	Wild	
Marias River	1	Yes	Yes	Yes	Wild	
McGregor Lake	2	Yes	Yes	Yes	Wild	
Middle Thompson Lake	4	Yes*	Yes	Yes	Wild	
Miles City Fish Hatchery	1	Yes	Yes	Yes	Hatchery	
Milk River	1	Yes	Yes	Yes	Wild	
Missouri River	17	Yes	Yes	Yes	Wild	NZMS, CLPW, EWM
Murray Springs Hatchery	1	Yes	Yes	Yes	Hatchery	
Nelson Reservoir	7	Yes*	Yes	Yes	Wild	
Nelson's Spring Creek	1	Yes	Yes	Yes	Wild	NZMS

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Waterbody	Site	Macrophyte Sampling	Invert Sampling	Plankton Sampling	Type	AIS Occurrences
Nelson's Spring Creek Ranch	1	Yes	Yes	Yes	Hatchery	
North Fork Flathead River	5	No	No	Yes	Plankton Only	
Painted Rocks Reservoir	1	Yes	Yes	Yes	Wild	
Pelican Point Pond #2	1	Yes	Yes	Yes	WFT	
Peterson Lake	1	No	No	Yes	Plankton Only	
Placid Lake	1	Yes	Yes	Yes	Wild	
Post Creek	1	Yes	Yes	Yes	Wild	CLPW
Priest Butte Lake	1	Yes*	Yes	Yes	Wild	
Quake Lake	5	Yes*	Yes	Yes	Wild	
Rainbow Springs Trout Farm	1	Yes	Yes	Yes	Hatchery	
Rose Creek	1	Yes	Yes	Yes	Hatchery	
Ruby Reservoir	1	No	No	Yes	Plankton Only	
Sacajawea Lagoon	2	Yes*	Yes	Yes	Wild	
Salmon Lake	1	Yes	Yes	Yes	Wild	
Savage Lake	3	Yes*	Yes	Yes	Wild	
Seeley Lake	1	Yes	Yes	Yes	Wild	
Sekokini Springs Hatchery	1	Yes	Yes	Yes	Hatchery	
Smiling Moose Ranch	7	Yes	Yes	Yes	Troubles hooting	
South Sandstone Reservoir	1	No	No	Yes	Plankton Only	
Spring Meadow Lake	2	Yes	Yes	Yes	Wild	
St. Regis River	2	Yes	Yes	Yes	Wild	
Stillwater River	2	Yes*	Yes	Yes	Wild	
Summit Lake	1	No	No	Yes	Plankton Only	
Sun Ranch Hatchery	1	Yes	Yes	Yes	Hatchery	
Swan Lake	1	No	No	Yes	Wild	
Swan River	2	Yes	Yes	Yes	Wild	
Tiber Reservoir	5	Yes	Yes	Yes	Wild	
Tongue River	1	Yes	Yes	Yes	Wild	
Tongue River Reservoir	2	Yes	Yes	Yes	Wild	
Topless Lake	1	No	No	Yes	Wild	
Toston Reservoir	2	Yes*	Yes	Yes	Wild	EWM, CLPW
Triangle Pond	2	Yes*	Yes	Yes	Wild	
Upper Carter Pond	1	Yes	Yes	Yes	Wild	
Upper Stillwater Lake	1	Yes	Yes	Yes	Yes	
Upper Thompson Lake	5	Yes*	Yes	Yes	Wild	

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Waterbody	Site	Macrophyte Sampling	Invert Sampling	Plankton Sampling	Type	AIS Occurrences
Van Lake	1	Yes	Yes	Yes	Wild	
Wade Lake	1	Yes	Yes	Yes	Wild	
Washoe Park Trout Hatchery	1	Yes	Yes	Yes	Hatchery	
Wayne Edsall Pond (Glen Park Lake)	2	Yes*	Yes	Yes	Wild	
Westslope Trout Co.	1	Yes	Yes	Yes	Hatchery	
Whitefish Lake	1	Yes	Yes	Yes	Wild	
Whitefish River	1	Yes	Yes	Yes	Wild	
Willow Creek Reservoir	3	Yes*	Yes	Yes	Wild	
Yaak River	2	Yes	Yes	Yes	Wild	
Yellowstone River	8	Yes	Yes	Yes	Wild	
Yellowstone River Trout Hatchery	1	Yes	Yes	Yes	Hatchery	

* Indicates locations where more comprehensive macrophyte surveys were conducted. See Appendix A.

Literature Cited

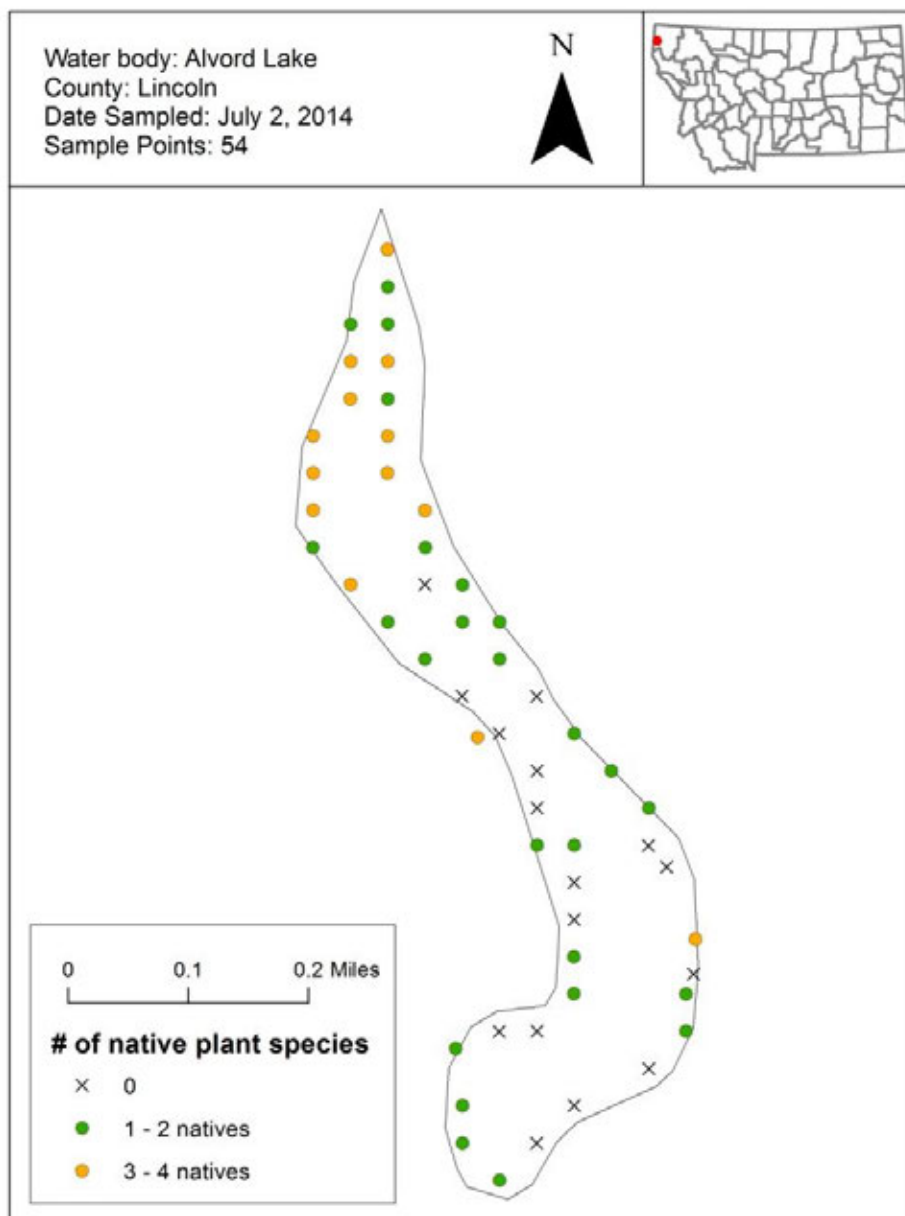
Frischer, M.E., Nierzwicki-Bauer, S.A., Kelly, K.L. 2011. Reliability of Early Detection of *Dreissena* spp. Larvae by Cross Polarized Light Microscopy, Image Flow Cytometry, and Polymerase Chain Reaction Assays: Results of a Community Double-Blind Round Robin Study (Round Robin Study Phase II). [http://www.musselmonitoring.com/Reports/RRII%20Final%20Report%20\(2010\).pdf](http://www.musselmonitoring.com/Reports/RRII%20Final%20Report%20(2010).pdf).

Appendix A. Results of Aquatic Plant Surveys

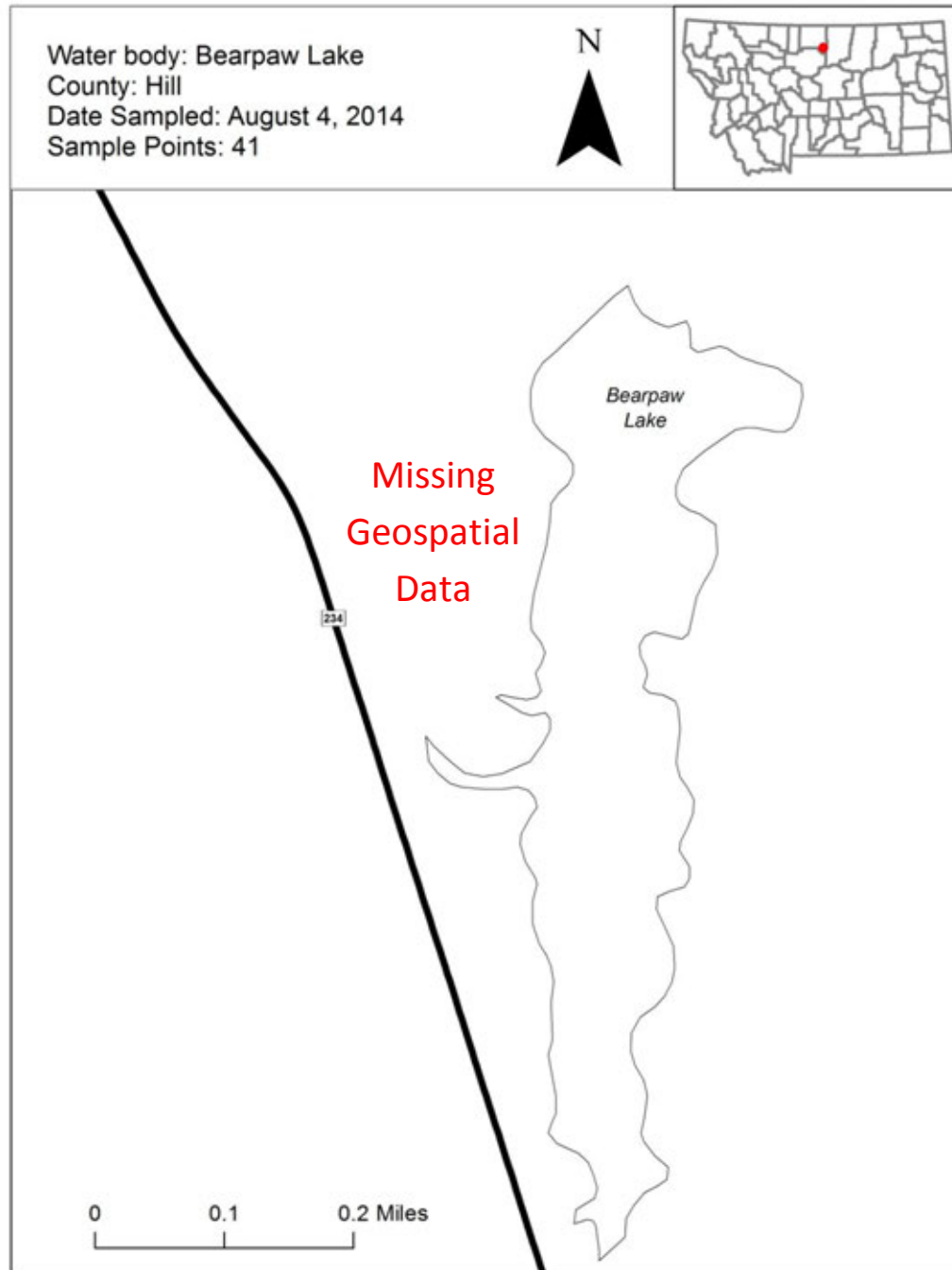
This appendix contains details of plant sampling within the list water bodies. Plant locations and species frequency (based on all sample points within the water body) are noted for each water body surveyed.

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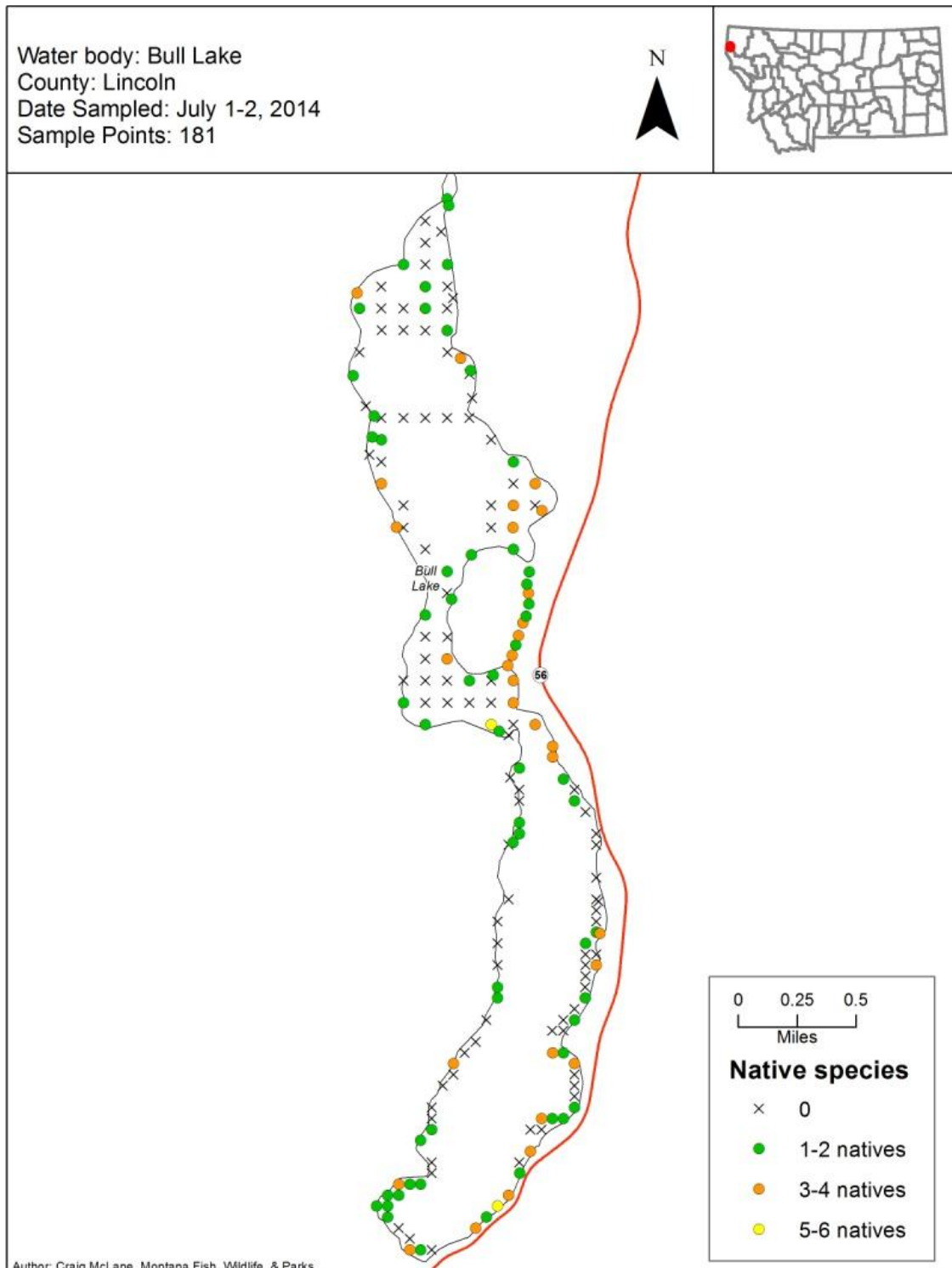
Alvord Lake	A2
Bearpaw Lake	A3
Bull Lake.....	A4
Missouri River within the Canyon Ferry Delta	A6
Canyon Ferry Reservoir (including Pond 1, Pond 2, Pond 3, Pond 4)	A8
Freezeout Lake Complex (including Main Lake, Pond 1, Pond 2, Pond 3, Pond5, Pond 6, & Priest Butter Lake)	A11
Hauser Lake	A13
Helena Valley Regulating Reservoir	A14
Jefferson Slough and Jefferson River.....	A15
Lake Elmo.....	A17
Lake Helena	A18
Lake Josephine.....	A19
Laurel Pond.....	A20
Holter Lake	A21
Lower Thompson Lake (Chain of Lakes)	A23
Middle Thompson Lake (Chain of Lakes)	A24
Missouri River (Toston to Canyon Ferry).....	A25
Nelson Reservoir	A27
Quake Lake	A28
Sacajawea Park Lagoon.....	A29
Savage Lake	A30
Stillwater River	A31
Toston Reservoir	A33
Triangle Pond	A34
Upper Thompson Lake (Chain of Lakes)	A35
Wayne Edsall Pond (Glen Park Lake)	A36
Willow Creek Reservoir (Madison Co.).....	A37



Species	Common Name	Species frequency
<i>Chara spp.</i>	Muskgrass	64.8%
<i>Isoetes spp.</i>	Quillwort species	1.9%
<i>Myriophyllum sibiricum</i>	Northern watermilfoil	25.9%
<i>Najas flexilis</i>	Slender water nymph	20.4%
<i>Nuphar polysepala</i>	Spatterdock	5.6%
<i>Potamogeton foliosus</i>	Leafy pondweed	16.7%
<i>Potamogeton spp.</i>	Unidentified native pondweed species	3.7%
<i>Potamogeton natans</i>	Floating-leaved pondweed	1.9%
<i>Potamogeton richardsonii</i>	Richardson's pondweed	3.7%

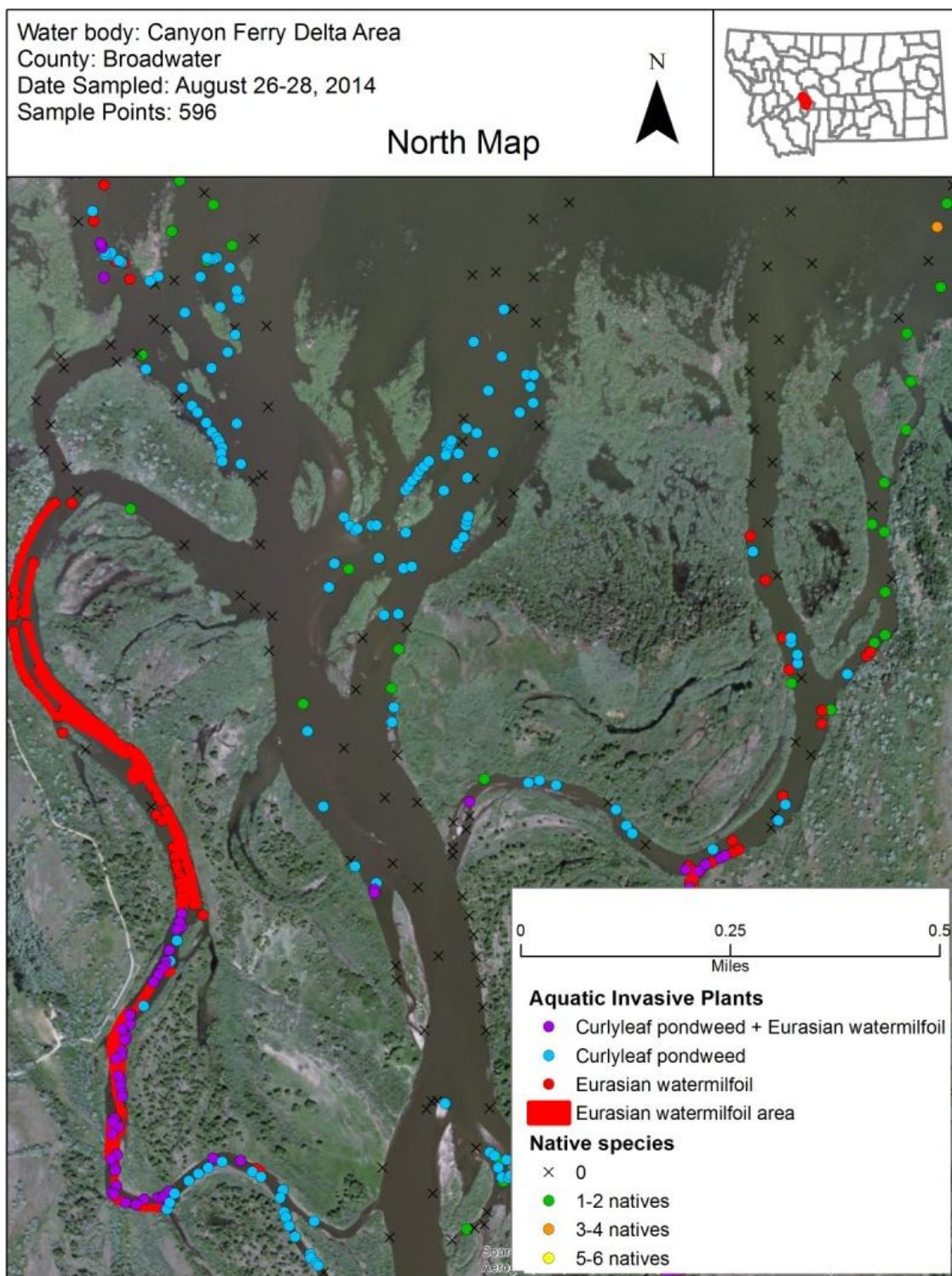


Species	Common name	Species frequency
<i>Ceratophyllum demersum</i>	Coontail	75.6%
<i>Myriophyllum sibiricum</i>	Northern watermilfoil	61.0%
<i>Potamogeton pectinatus</i>	Sago pondweed	56.1%
<i>Potamogeton richardsonii</i>	Richardson's pondweed	4.9%
<i>Ranunculus aquatilis</i>	White water buttercup	53.7%
<i>Sagittaria cuneata</i>	Arumleaf arrowhead	9.8%



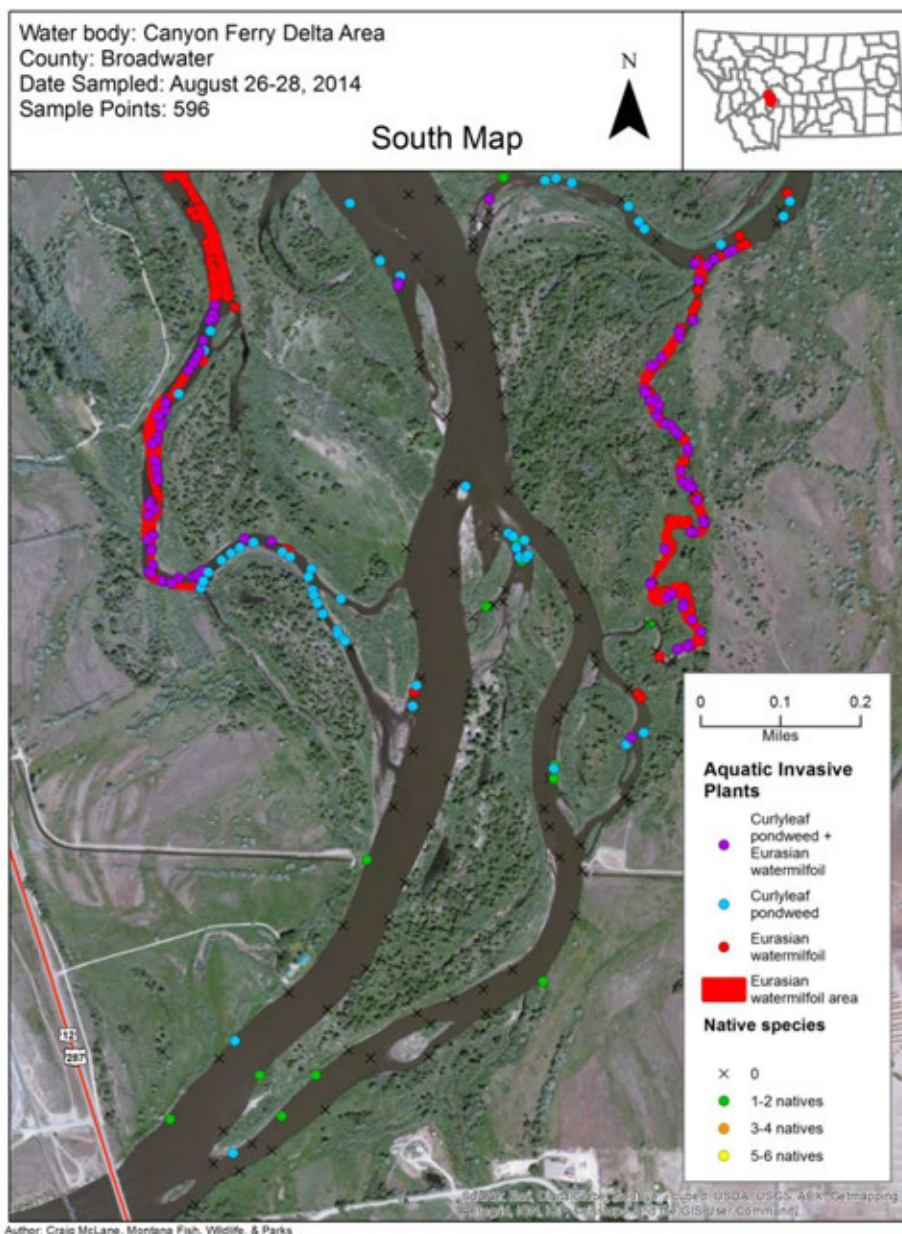
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Species	Common name	Species frequency
<i>Brasenia schreberi</i>	Watershield	0.6%
<i>Ceratophyllum demersum</i>	Coontail	0.6%
<i>Chara spp.</i>	Muskgrass	22.7%
<i>Elodea spp.</i>	Waterweed species	24.9%
<i>Isoetes spp.</i>	Quillwort species	14.4%
<i>Myriophyllum sibiricum</i>	Northern watermilfoil	1.1%
<i>Nuphar polysepala</i>	Spatterdock	1.1%
<i>Potamogeton friesii</i>	Flat-stalked pondweed	0.6%
<i>Potamogeton spp.</i>	Unidentified native pondweed species	4.4%
<i>Potamogeton natans</i>	Floating-leaved pondweed	0.6%
<i>Potamogeton praelongus</i>	White-stemmed pondweed	15.5%
<i>Potamogeton richardsonii</i>	Richardson's pondweed	2.8%
<i>Potamogeton robbinsii</i>	Fernleaf pondweed	9.4%
<i>Ranunculus aquatilis</i>	White water buttercup	5.0%
<i>Vallisneria americana</i>	Tapegrass	1.7%
<i>Zannichellia palustris</i>	Horned pondweed	1.1%

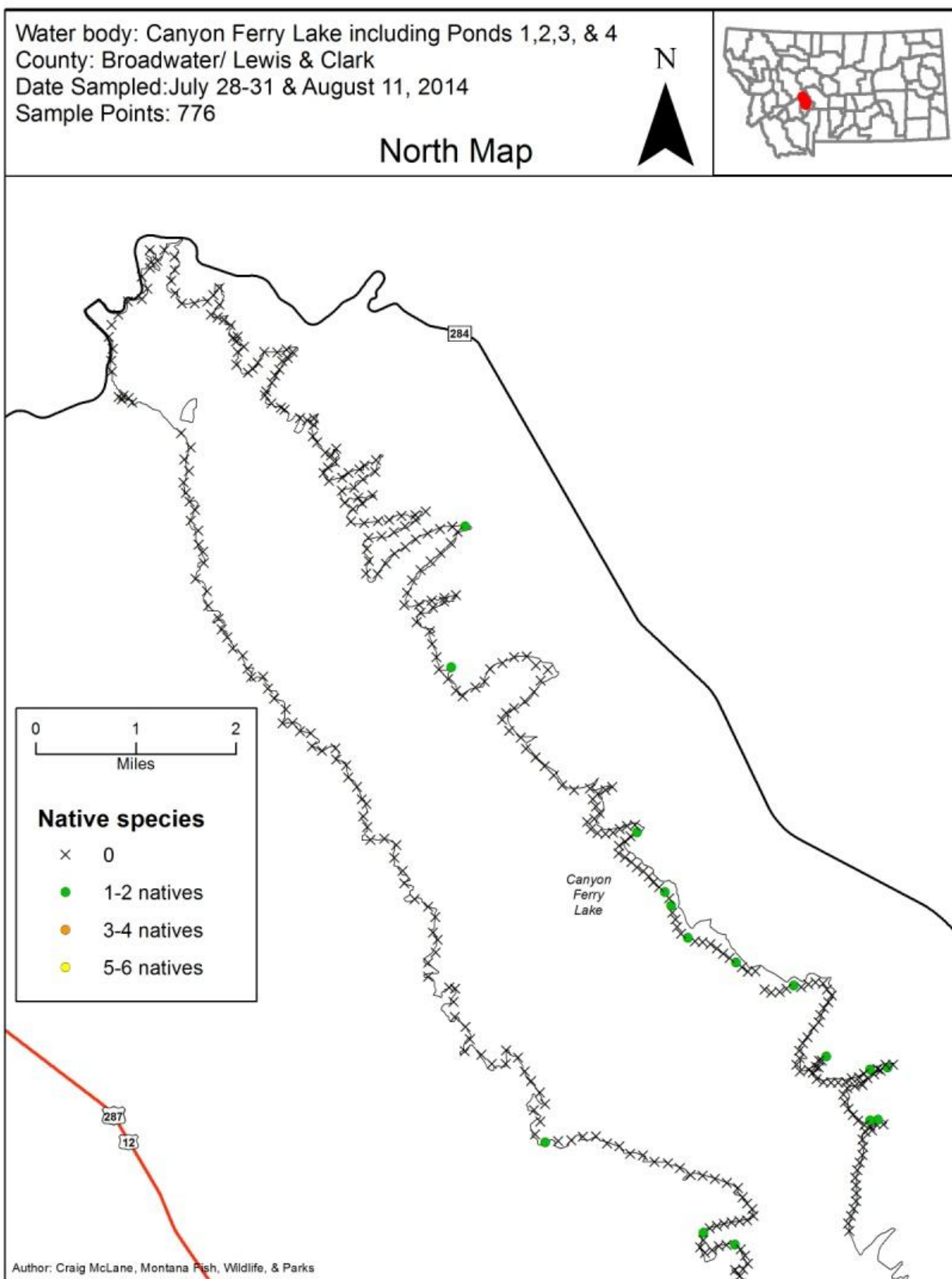


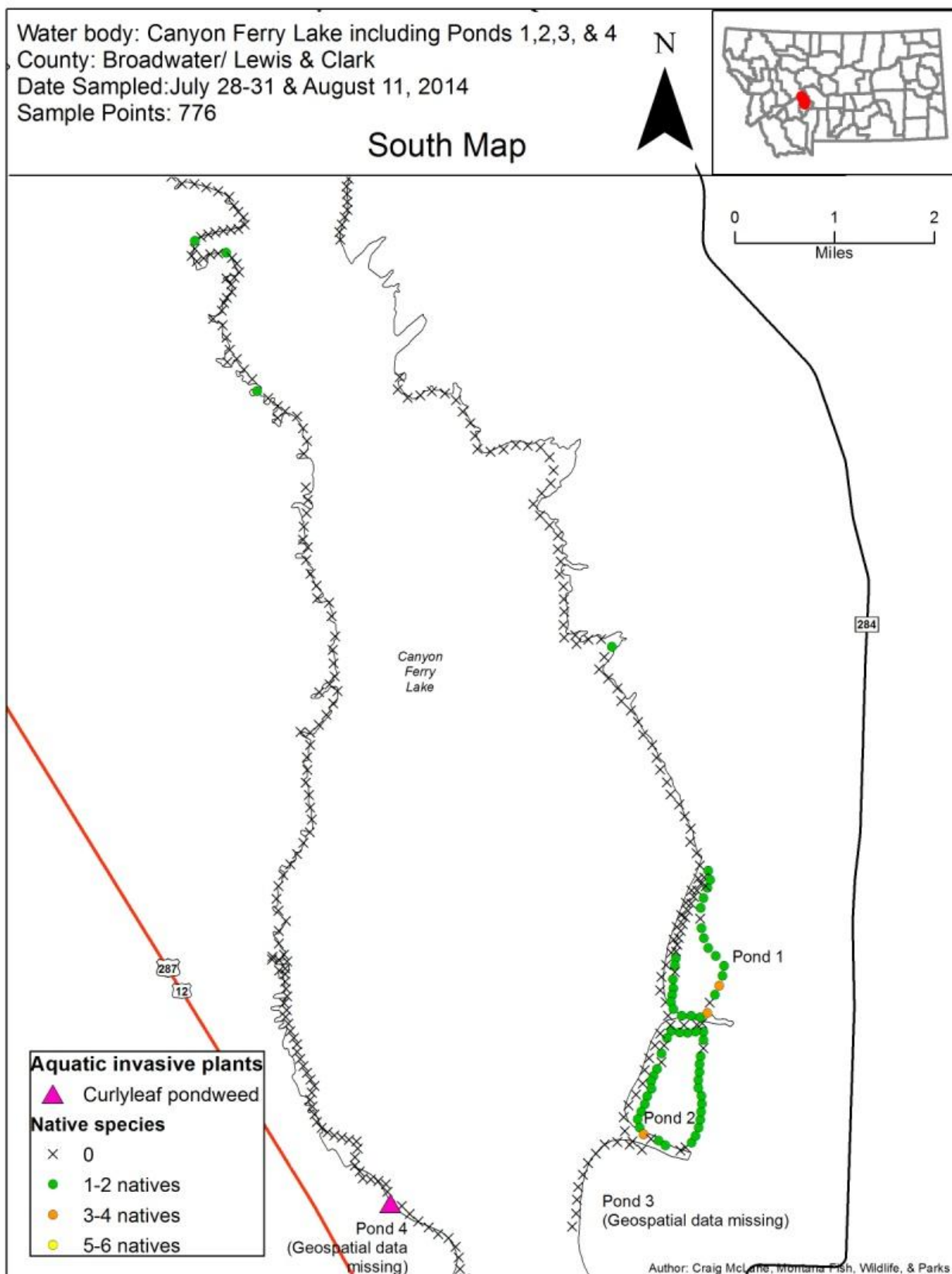
Author: Craig McLane, Montana Fish, Wildlife, & Parks

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Species	Common name	Species frequency
<i>Ceratophyllum demersum</i>	Coontail	2.5%
<i>Chara spp.</i>	Muskgrass	2.2%
<i>Elodea spp.</i>	Waterweed species	18.0%
<i>Hippuris vulgaris</i>	Mares tail	1.2%
<i>Myriophyllum sibiricum</i>	Northern watermilfoil	5.2%
<i>Myriophyllum spicatum</i>	Eurasian watermilfoil	37.8%
<i>Polygonum amphibium</i>	Water smartweed	2.3%
<i>Potamogeton crispus</i>	Curlyleaf pondweed	42.6%
<i>Potamogeton spp.</i>	Unidentified native pondweed species	6.2%
<i>Potamogeton pectinatus</i>	Sago pondweed	1.3%
<i>Sagittaria cuneata</i>	Arumleaf arrowhead	1.2%





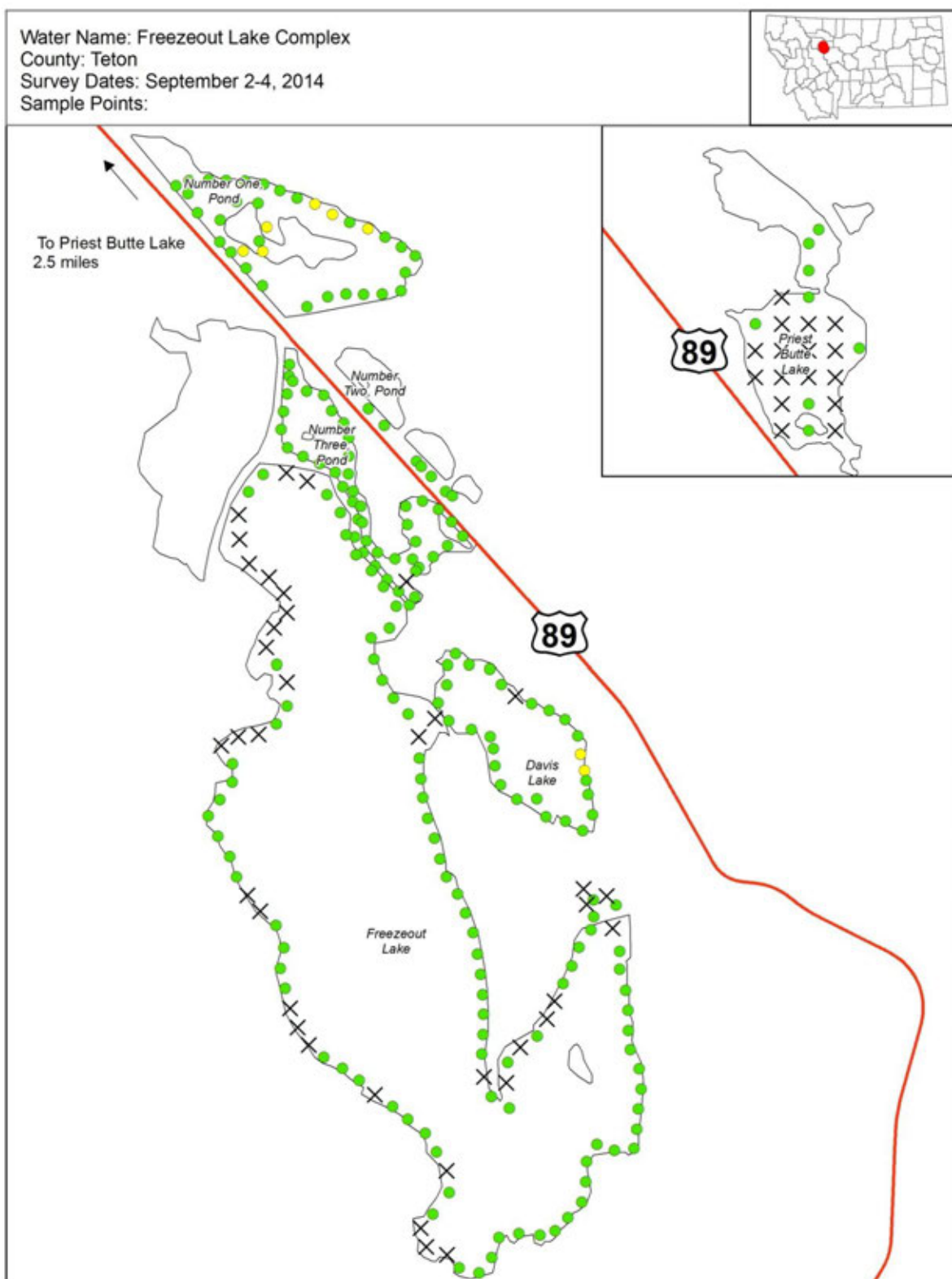
Canyon Ferry Reservoir		n=606
Species	Common name	Species frequency
<i>Polygonum amphibium</i>	Water smartweed	1.2%
<i>Potamogeton crispus</i>	Curlyleaf pondweed	0.2%
<i>Potamogeton pectinatus</i>	Sago pondweed	1.8%

Pond 1 - Canyon Ferry		n=40
Species	Common name	Species frequency
<i>Chara spp.</i>	Muskgrass	20.0%
<i>Callitriche spp.</i>	Water starwort species	2.5%
<i>Najas flexilis</i>	Slender water nymph	5.0%
<i>Polygonum amphibium</i>	Water smartweed	2.5%
<i>Potamogeton foliosus</i>	Leafy pondweed	32.5%
<i>Potamogeton spp.</i>	Unidentified native pondweed species	27.5%

Pond 2 - Canyon Ferry		n=38
Species	Common name	Species frequency
<i>Chara spp.</i>	Muskgrass	28.9%
<i>Elodea spp.</i>	Waterweed species	5.3%
<i>Isoetes spp.</i>	Quillwort species	2.6%
<i>Myriophyllum sibiricum</i>	Northern watermilfoil	13.2%
<i>Polygonum amphibium</i>	Water smartweed	18.4%
<i>Potamogeton pectinatus</i>	Sago pondweed	15.8%
<i>Ruppia maritima</i>	Ditchgrass	44.7%
<i>Vallisneria americana</i>	Tapegrass	7.9%

Pond 3 - Canyon Ferry		n=44
Species	Common name	Species frequency
<i>Chara spp.</i>	Muskgrass	2.3%
<i>Elodea spp.</i>	Waterweed species	2.3%
<i>Isoetes spp.</i>	Quillwort species	9.1%
<i>Lemna minor</i>	Lesser duckweed	4.5%
<i>Potamogeton crispus</i>	Curlyleaf pondweed	25.0%
<i>Potamogeton filiformis</i>	Slender-leaved pondweed	38.6%
<i>Vallisneria americana</i>	Tapegrass	4.5%

Pond 4 - Canyon Ferry		n=48
Species	Common name	Species frequency
<i>Elodea spp.</i>	Waterweed species	2.1%
<i>Isoetes spp.</i>	Quillwort species	4.2%
<i>Myriophyllum spicatum</i>	Eurasian watermilfoil	8.3%
<i>Polygonum amphibium</i>	Water smartweed	2.1%
<i>Potamogeton crispus</i>	Curlyleaf pondweed	14.6%
<i>Potamogeton spp.</i>	Unidentified native pondweed species	64.6%
<i>Ranunculus aquatilis</i>	White water buttercup	6.3%
<i>Sagittaria cuneata</i>	Arrowleaf arrowhead	4.2%
<i>Vallisneria americana</i>	Tapegrass	8.3%



Freezeout Lake Complex - Main Lake		n=118
Species	Common Name	Species frequency
<i>Ruppia maritima</i>	Ditchgrass	72.9%

Freezeout Lake Complex - Pond 1		n=35
Species	Common Name	Species frequency
<i>Chara</i> spp.	Muskgrass	25.7%
<i>Isoetes</i> spp.	Quillwort species	5.7%
<i>Myriophyllum sibiricum</i>	Northern watermilfoil	74.3%
<i>Potamogeton foliosus</i>	Leafy pondweed	2.9%
<i>Potamogeton pectinatus</i>	Sago pondweed	71.4%
<i>Potamogeton vaginatus</i>	Sheathing pondweed	11.4%

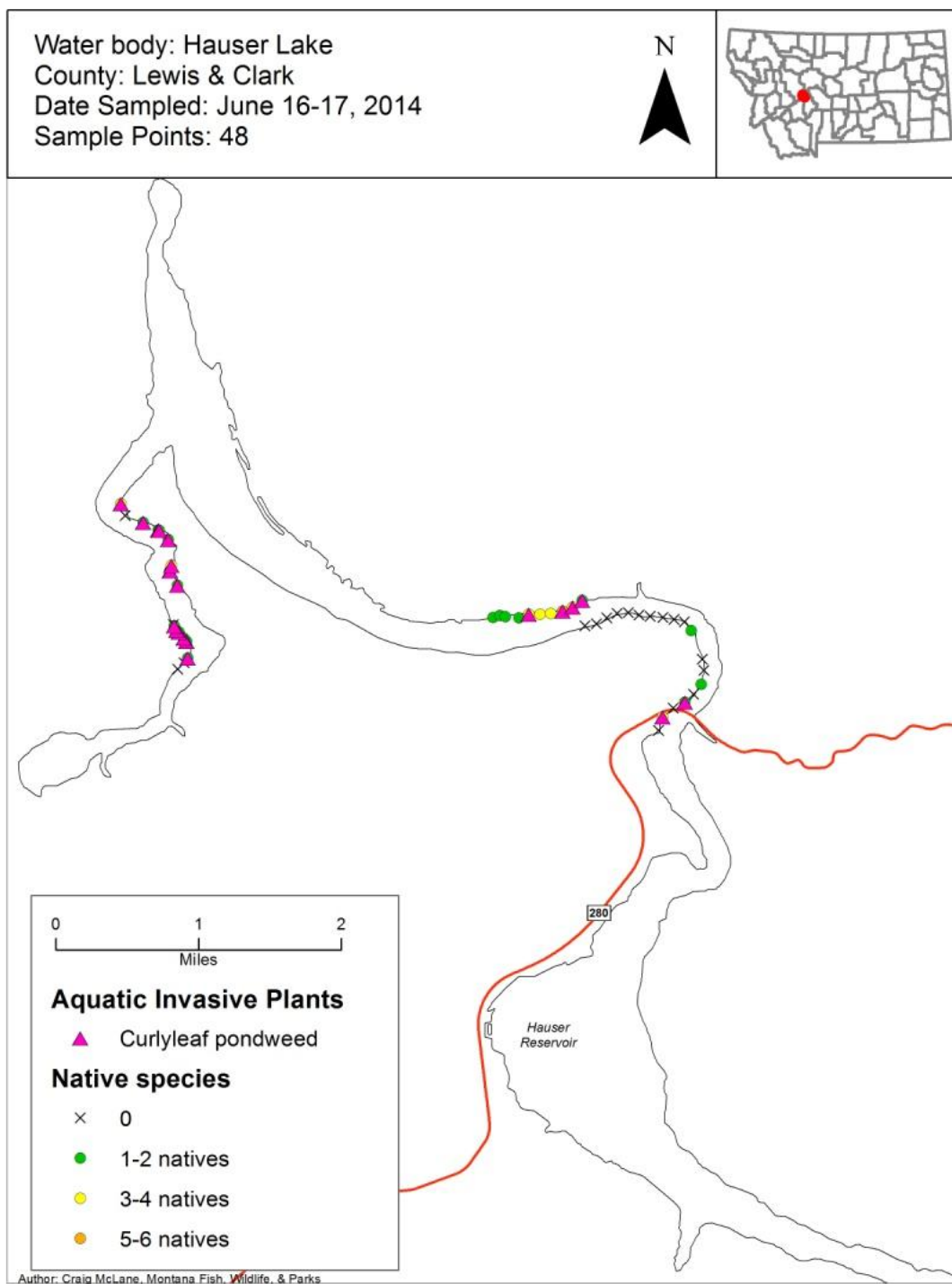
Freezeout Lake Complex - Pond 2		n=7
Species	Common Name	Species frequency
<i>Ruppia maritima</i>	Ditchgrass	100.0%

Freezeout Lake Complex - Pond 3		n=46
Species	Common Name	Species frequency
<i>Chara</i> spp.	Muskgrass	4.3%
<i>Myriophyllum sibiricum</i>	Northern watermilfoil	6.5%
<i>Potamogeton pectinatus</i>	Sago pondweed	65.2%
<i>Ruppia maritima</i>	Ditchgrass	43.5%

Freezeout Lake Complex - Pond 5		n=28
Species	Common Name	Species frequency
<i>Ceratophyllum demersum</i>	Coontail	53.6%
<i>Chara</i> spp.	Muskgrass	3.6%
<i>Elodea</i> spp.	Waterweed species	3.6%
<i>Isoetes</i> spp.	Quillwort species	3.6%
<i>Ruppia maritima</i>	Ditchgrass	92.9%

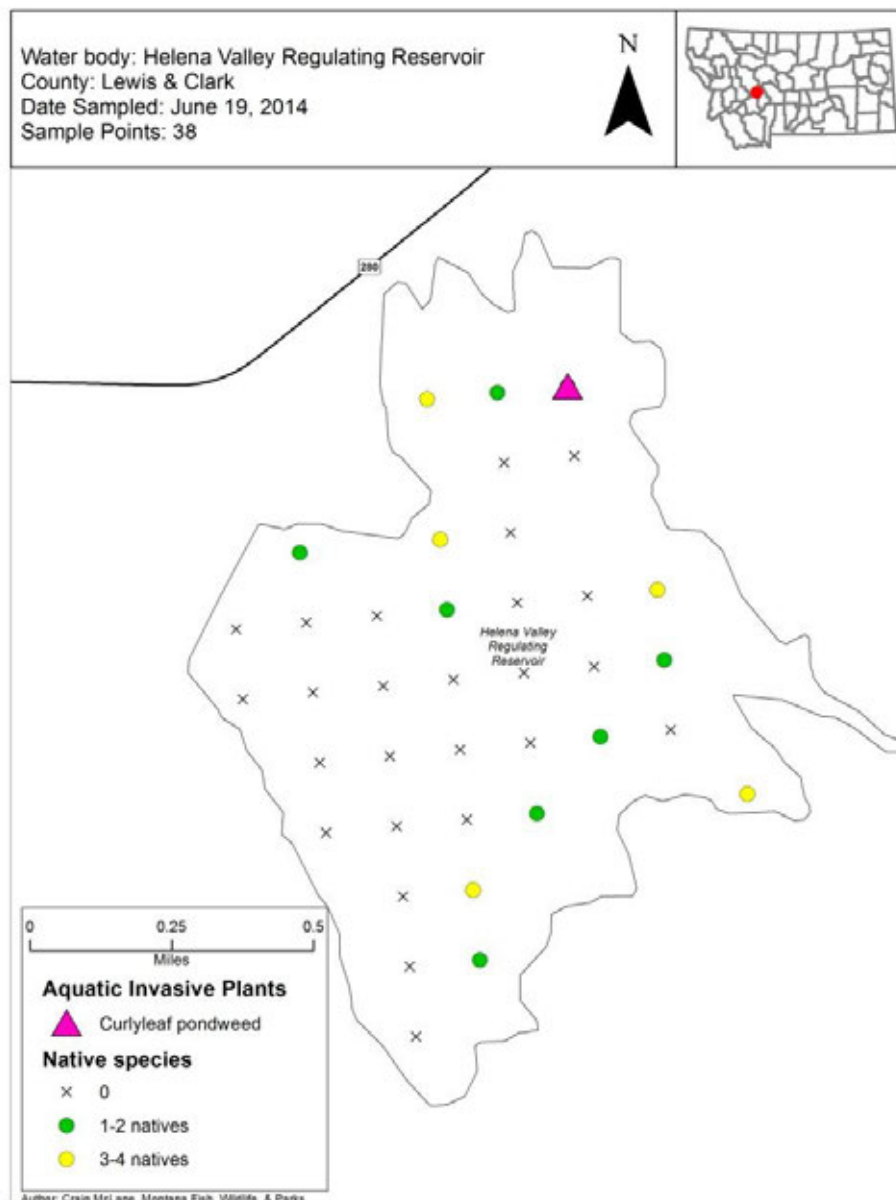
Freezeout Lake Complex - Pond 6		n=6
Species	Common Name	Species frequency
<i>Ruppia maritima</i>	Ditchgrass	50.0%

Freezeout Lake Complex - Priest Butte Lake		n=24
Species	Common Name	Species frequency
<i>Potamogeton</i> spp.	Unidentified native pondweed species	25.0%
<i>Potamogeton pectinatus</i>	Sago pondweed	20.8%



Species	Common name	Species frequency
<i>Ceratophyllum demersum</i>	Coontail	4.2%
<i>Elodea</i> spp.	Waterweed species	56.3%
<i>Myriophyllum sibiricum</i>	Northern watermilfoil	8.3%
<i>Potamogeton crispus</i>	Curlyleaf pondweed	43.8%
<i>Ranunculus aquatilis</i>	White water buttercup	18.8%

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Species	Common name	Species frequency
<i>Ceratophyllum demersum</i>	Coontail	2.6%
<i>Chara</i> spp.	Muskgrass	18.4%
<i>Callitriche</i> spp.	Water starwort species	15.8%
<i>Elodea</i> spp.	Waterweed species	5.3%
<i>Isoetes</i> spp.	Quillwort species	2.6%
<i>Myriophyllum sibiricum</i>	Northern watermilfoil	2.6%
<i>Potamogeton crispus</i>	Curlyleaf pondweed	2.6%
<i>Potamogeton</i> spp.	Unidentified native pondweed species	2.6%
<i>Potamogeton pectinatus</i>	Sago pondweed	10.5%
<i>Ranunculus aquatilis</i>	White water buttercup	5.3%
<i>Zannichellia palustris</i>	Horned pondweed	2.6%

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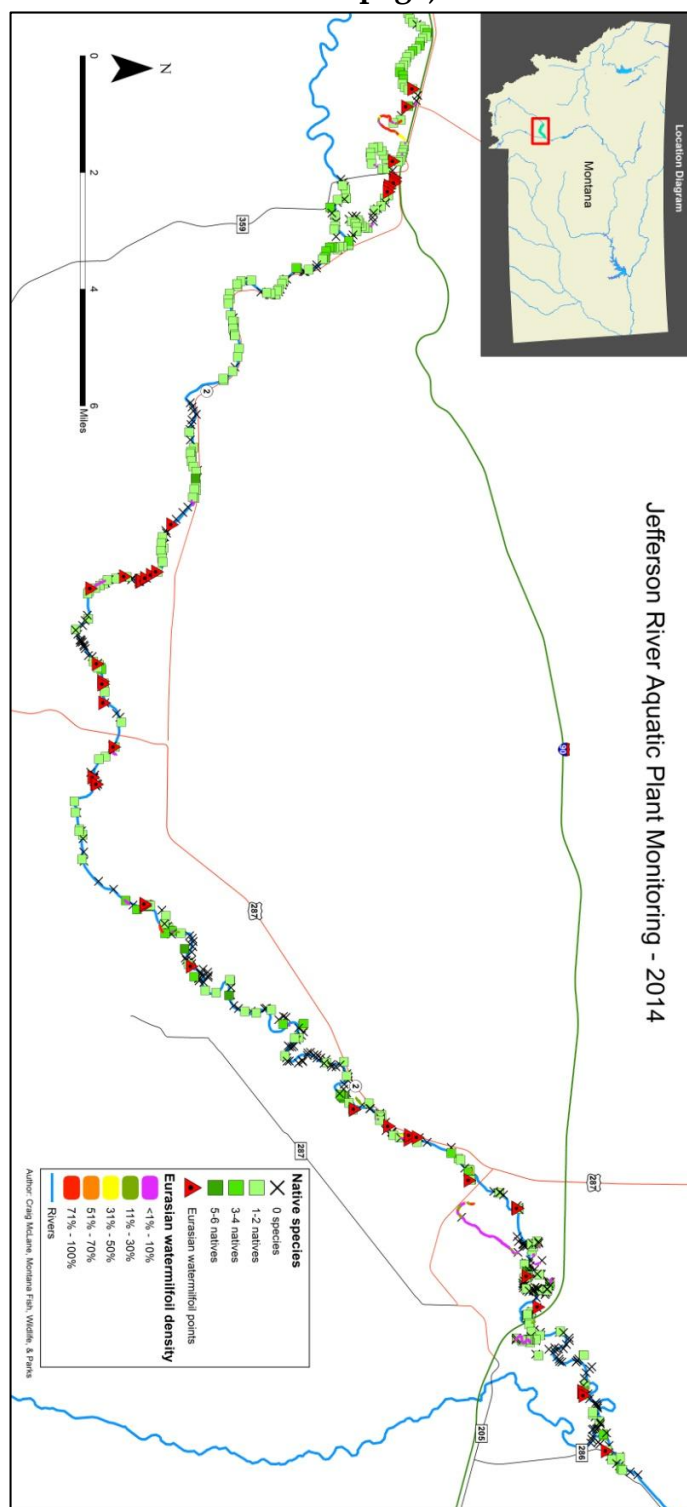
Water body: Jefferson Slough and Jefferson River

County: Jefferson/Madison/Gallatin/Broadwater

Date Sampled: Jefferson Slough – August 12-13, 2014; Jefferson River - July 14-18, 2014

Sample Points: Jefferson Slough – 375; Jefferson River - 687

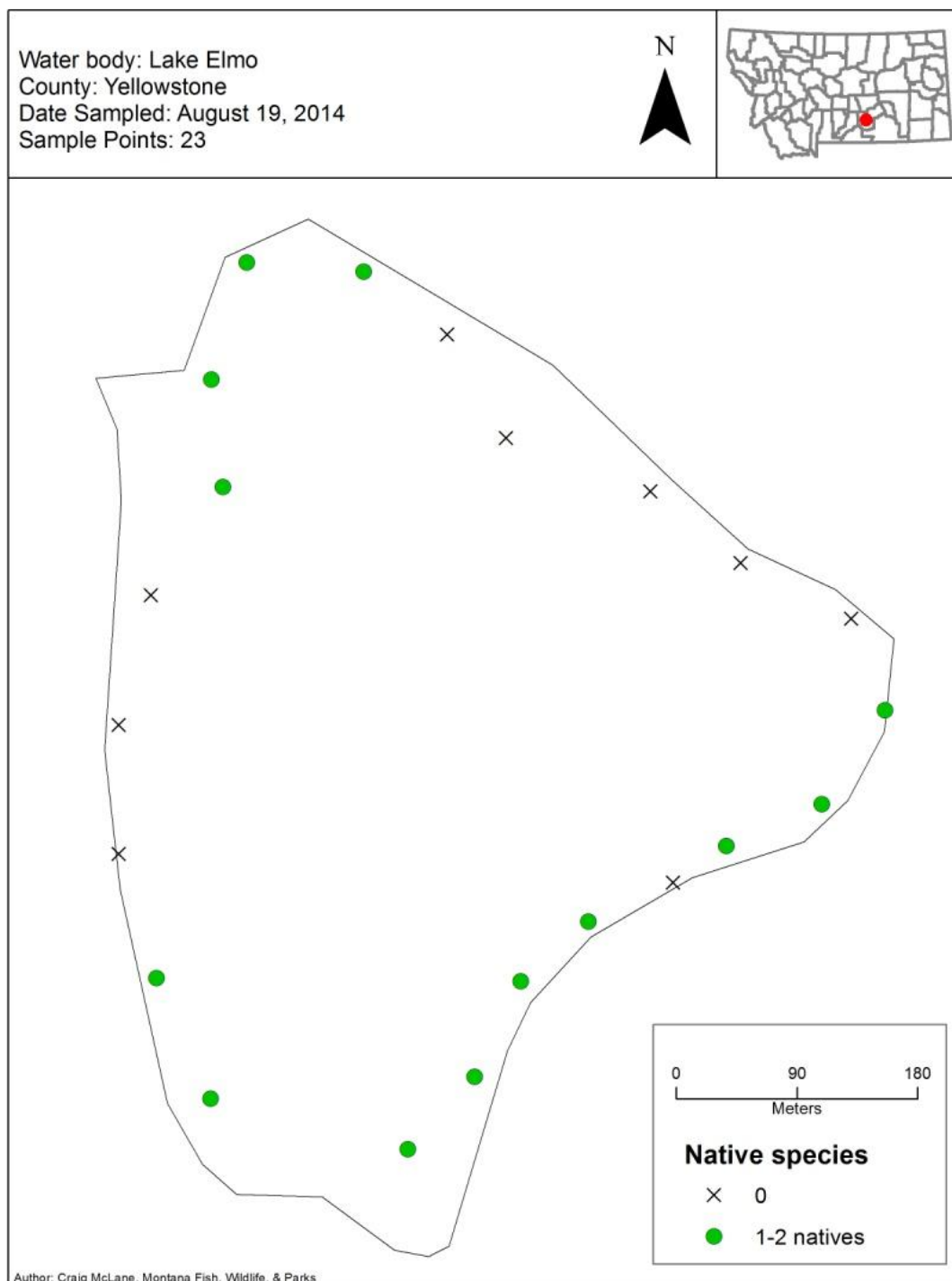
Detailed maps available on the FWP website or by contacting FWP (too large to fit on the page)



Jefferson Slough		n= 375
Species	Common name	Species frequency
<i>Ceratophyllum demersum</i>	Coontail	12.5%
<i>Elodea</i> spp.	Waterweed species	15.5%
<i>Lemna minor</i>	Lesser duckweed	4.8%
<i>Myriophyllum sibiricum</i>	Northern watermilfoil	9.1%
<i>Myriophyllum spicatum</i>	Eurasian watermilfoil	66.7%
<i>Polygonum amphibium</i>	Water smartweed	0.3%
<i>Potamogeton</i> spp.	Unidentified native pondweed species	14.9%
<i>Potamogeton pectinatus</i>	Sago pondweed	2.7%
<i>Potamogeton richardsonii</i>	Richardson's pondweed	5.9%
<i>Ranunculus aquatilis</i>	White water buttercup	0.8%

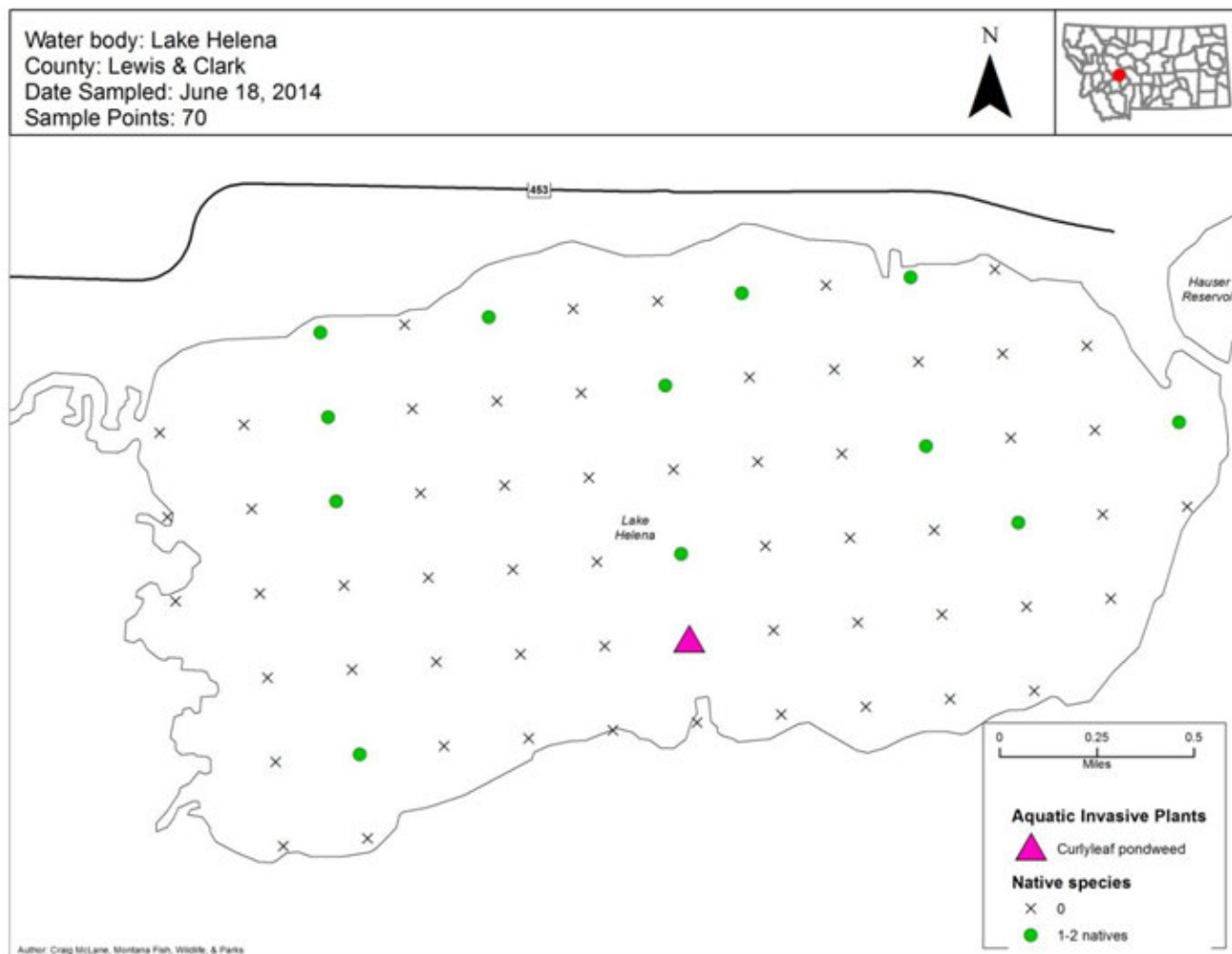
Jefferson River		n= 687
Species	Common name	Species frequency
<i>Ceratophyllum demersum</i>	Coontail	1.7%
<i>Chara</i> spp.	Muskgrass	0.1%
<i>Elodea</i> spp.	Waterweed species	7.9%
<i>Hippuris vulgaris</i>	Mares tail	0.3%
<i>Lemna minor</i>	Lesser duckweed	1.2%
<i>Megalodonta beckii</i>	Water marigold	0.1%
<i>Myriophyllum sibiricum</i>	Northern watermilfoil	6.0%
<i>Myriophyllum spicatum</i>	Eurasian watermilfoil	20.4%
<i>Nitella</i> spp.	Nitella species	0.1%
<i>Polygonum amphibium</i>	Water smartweed	9.0%
<i>Potamogeton crispus</i>	Curlyleaf pondweed	0.1%
<i>Potamogeton</i> spp.	Unidentified native pondweed species	2.2%
<i>Potamogeton nodosus</i>	Longleaf pondweed	0.1%
<i>Potamogeton pectinatus</i>	Sago pondweed	18.9%
<i>Potamogeton praelongus</i>	White-stemmed pondweed	0.1%
<i>Potamogeton richardsonii</i>	Richardson's pondweed	2.2%
<i>Ranunculus aquatilis</i>	White water buttercup	1.7%
<i>Sagittaria cuneata</i>	Arumleaf arrowhead	8.0%
<i>Vallisneria americana</i>	Tapegrass	0.4%

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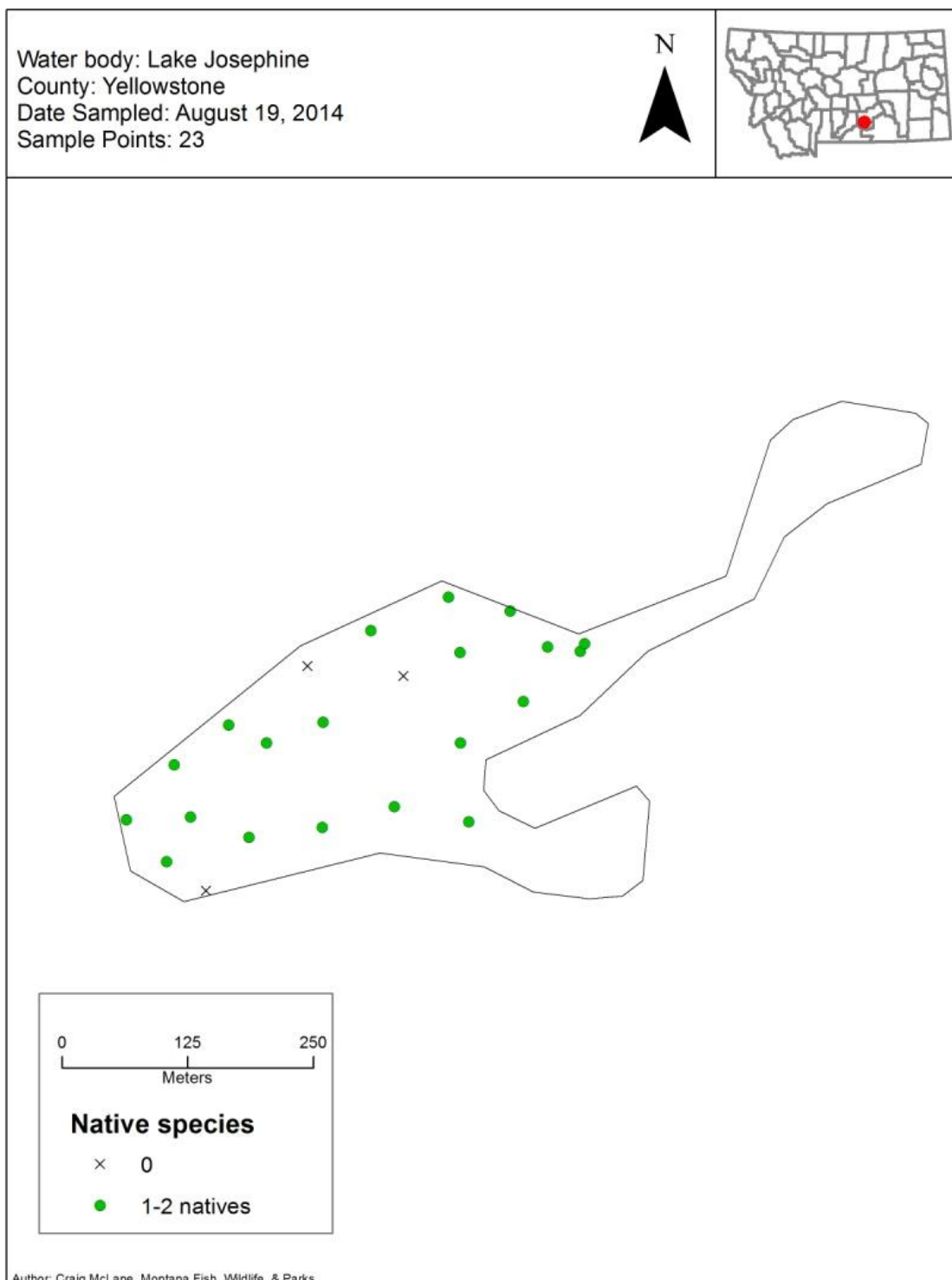


Species	Common Name	Species frequency
<i>Elodea</i> spp.	Waterweed species	13.0%
<i>Nitella</i> spp.	Nitella species	13.0%
<i>Potamogeton foliosus</i>	Leafy pondweed	13.0%
<i>Potamogeton pectinatus</i>	Sago pondweed	56.5%

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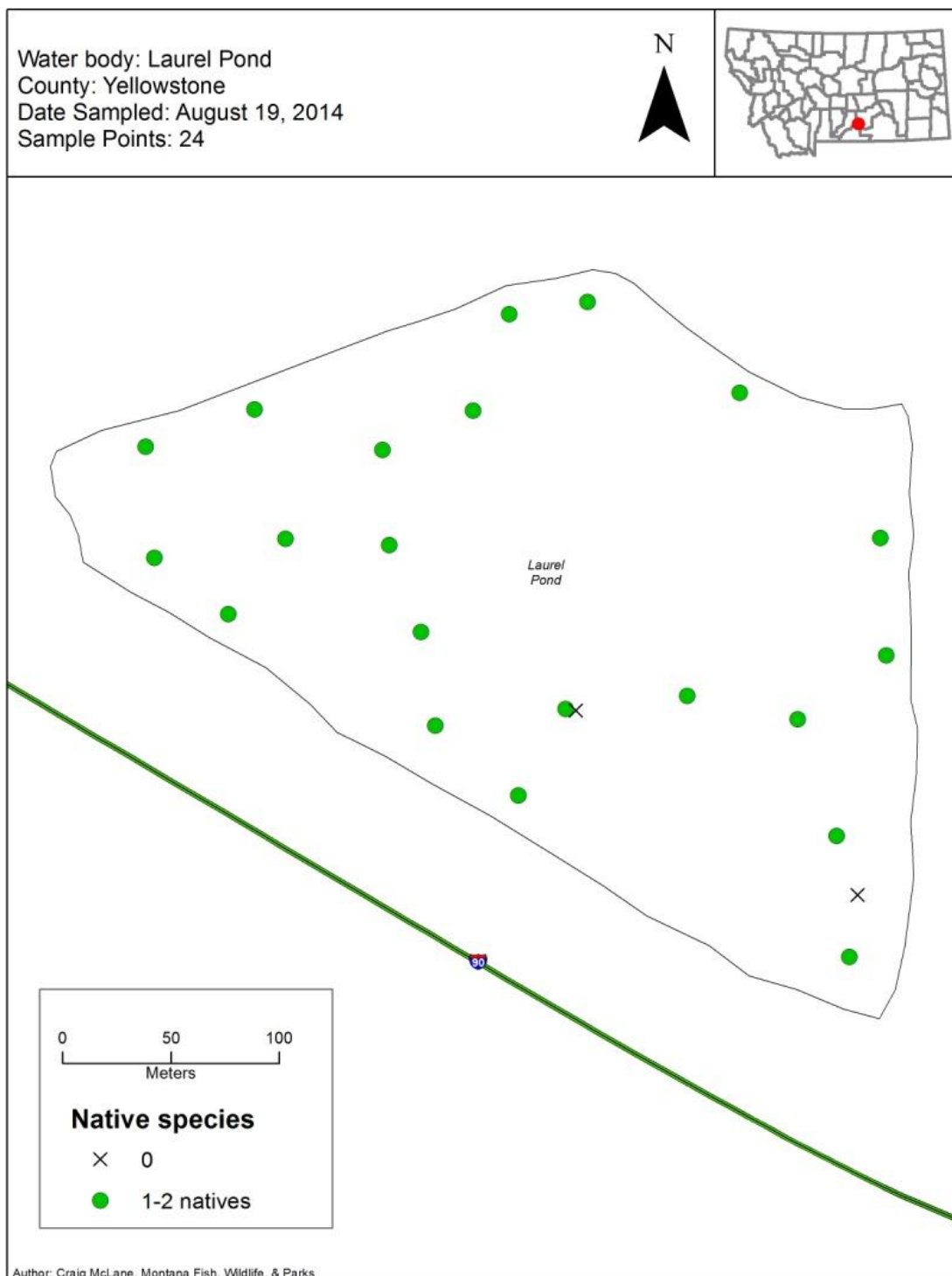


Species	Common name	Species frequency
<i>Elodea</i> spp.	Waterweed species	1.4%
<i>Potamogeton crispus</i>	Curlyleaf pondweed	1.4%
<i>Potamogeton pectinatus</i>	Sago pondweed	14.3%
<i>Potamogeton richardsonii</i>	Richardson's pondweed	1.4%

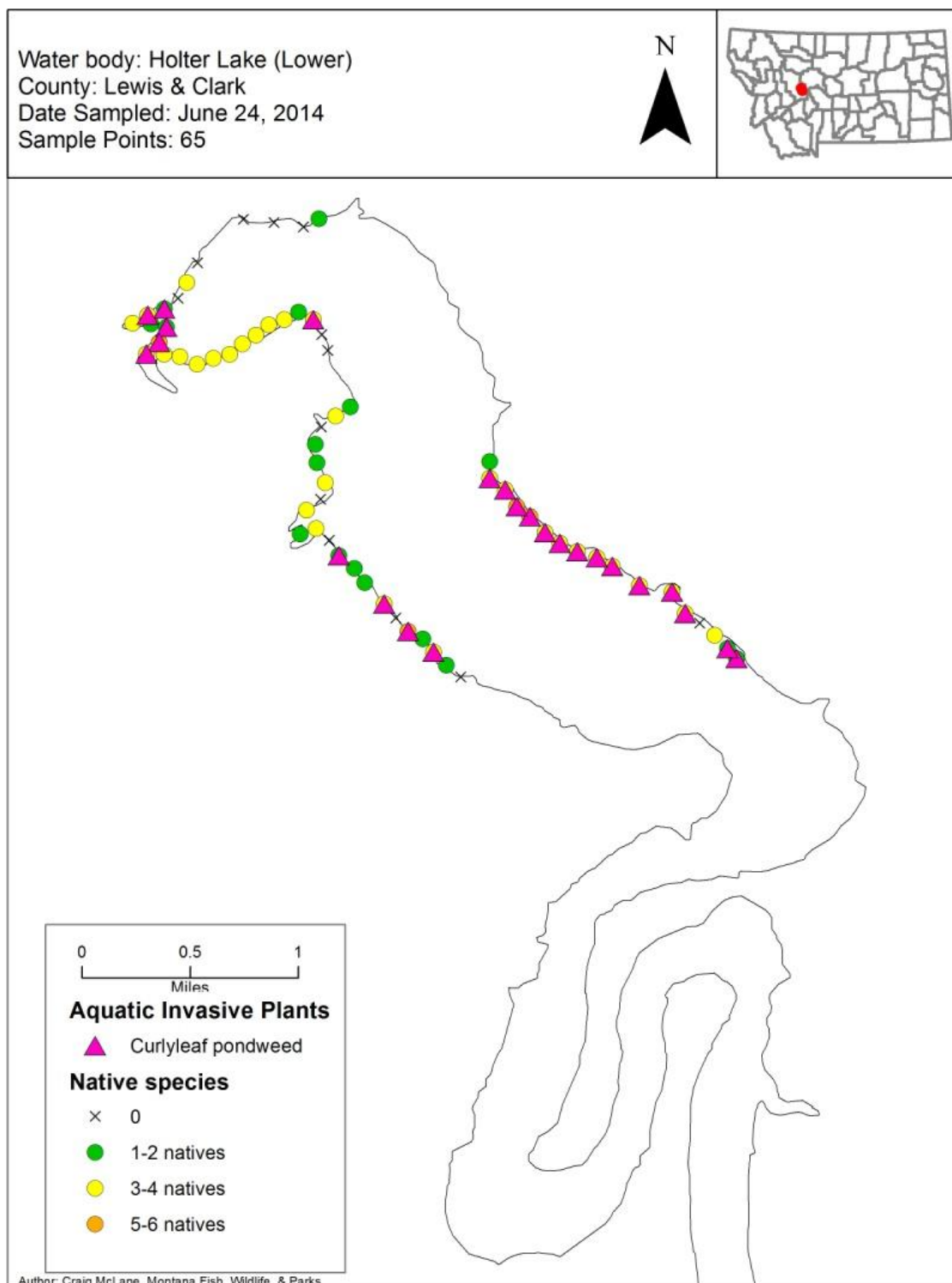


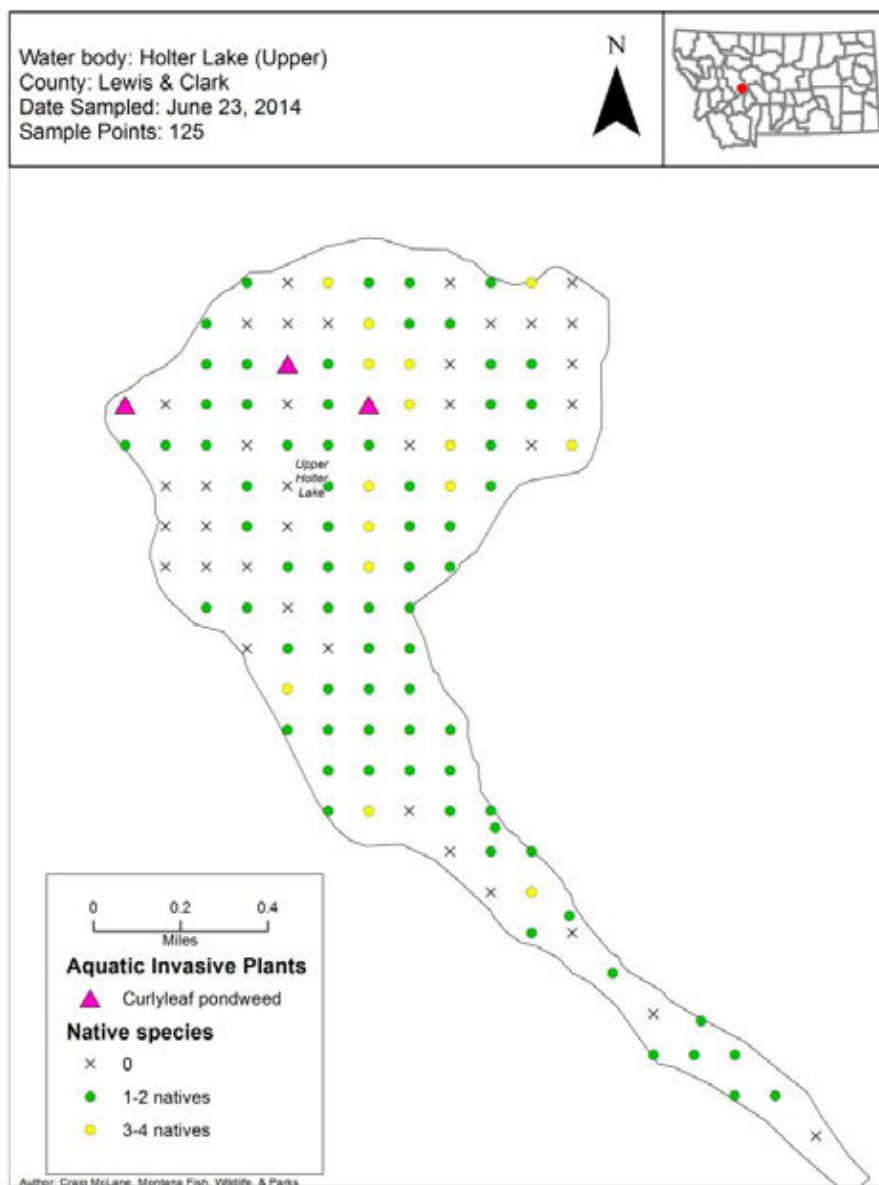
Species	Common name	Species frequency
<i>Ceratophyllum demersum</i>	Coontail	78.3%
<i>Potamogeton filiformis</i>	Slender-leaved pondweed	30.4%

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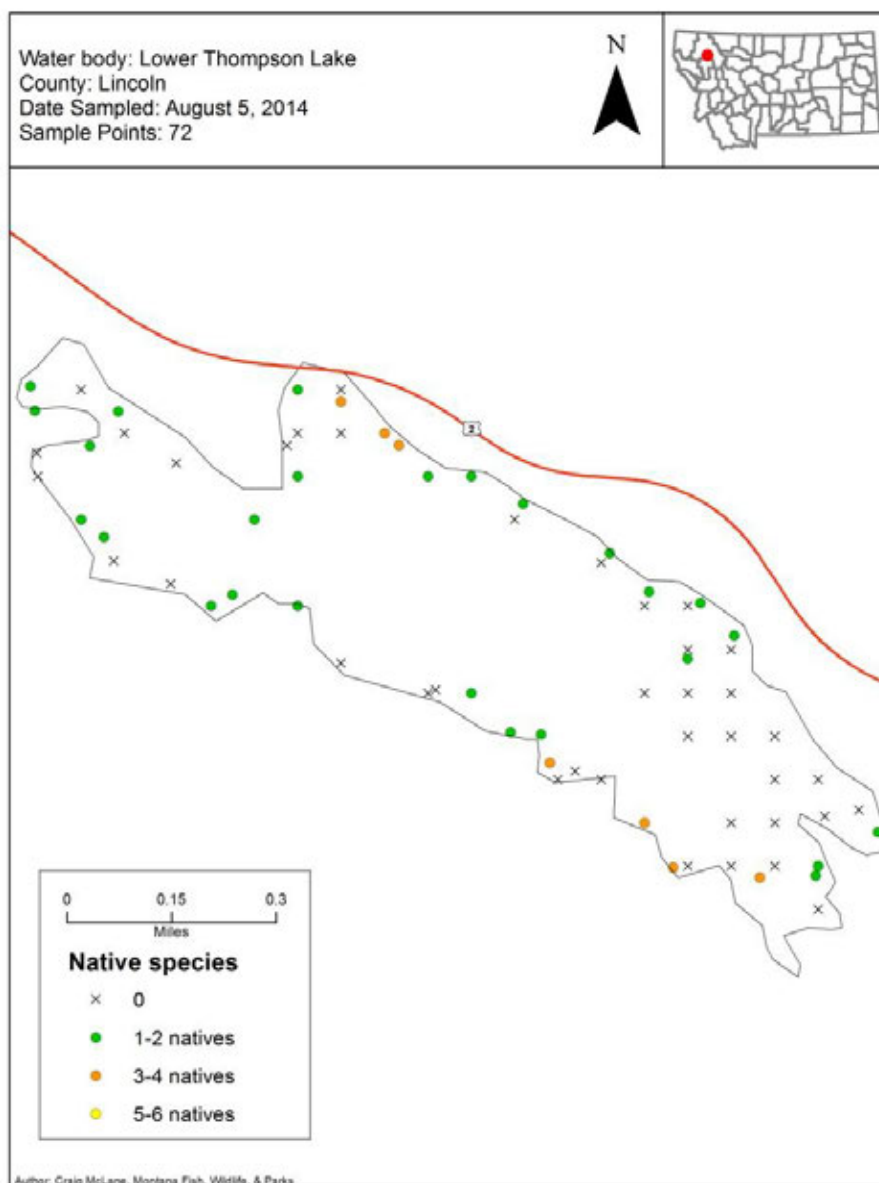


Species	Common name	Species frequency
<i>Chara spp.</i>	Muskgrass	33.3%
<i>Potamogeton pectinatus</i>	Sago pondweed	12.5%
<i>Potamogeton vaginatus</i>	Sheathing pondweed	70.8%

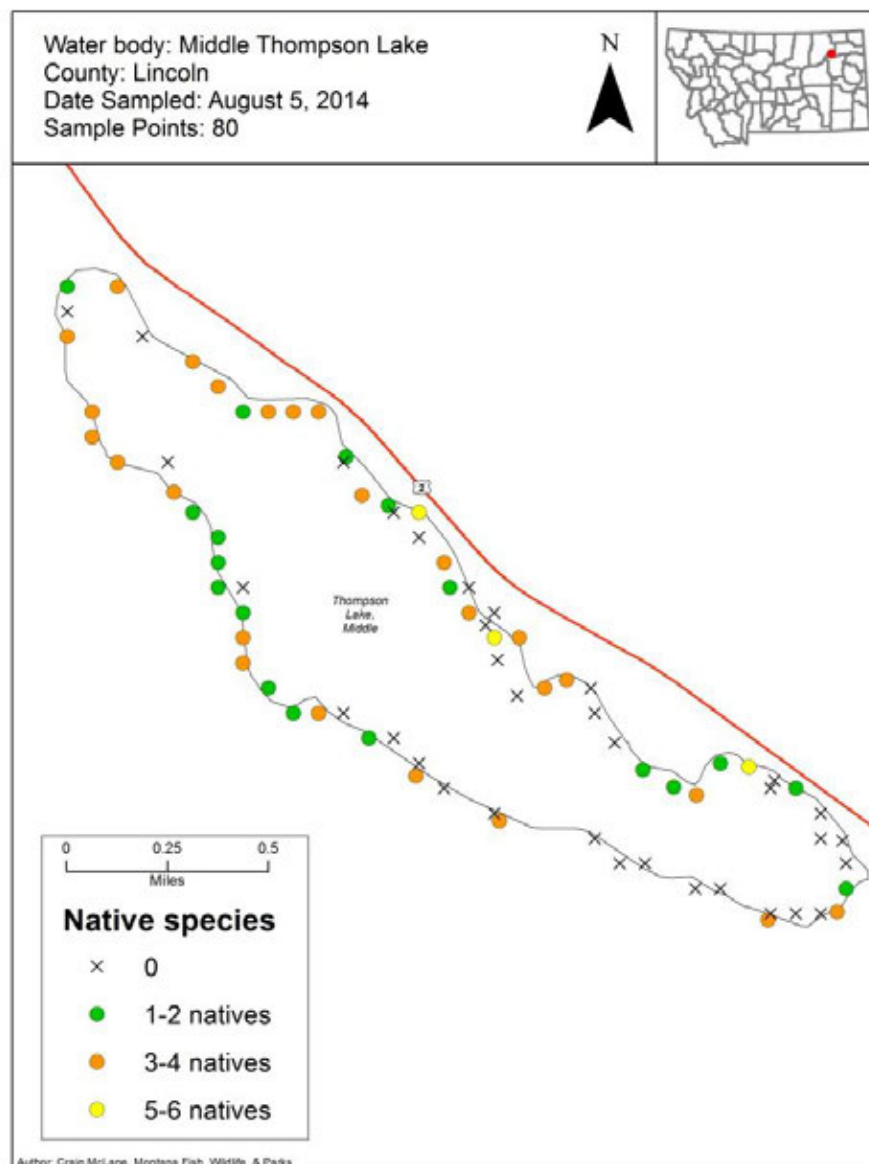




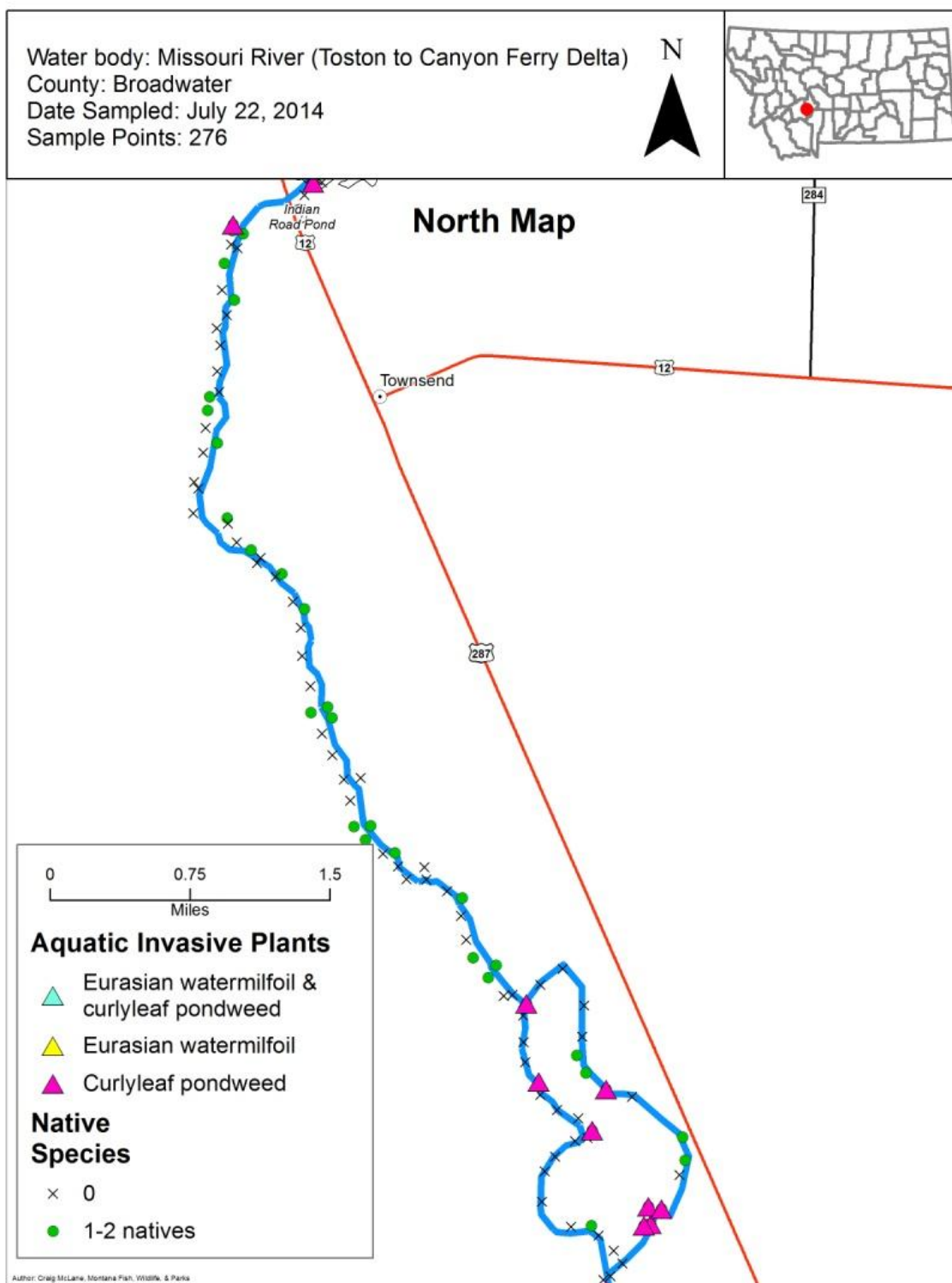
Species	Common name	Species frequency
<i>Algae spp.</i>	Algae species	24.7%
<i>Chara spp.</i>	Muskgrass	10.5%
<i>Callitriche spp.</i>	Water starwort species	0.5%
<i>Elodea spp.</i>	Waterweed species	35.8%
<i>Myriophyllum sibiricum</i>	Northern watermilfoil	1.1%
<i>Potamogeton crispus</i>	Curlyleaf pondweed	14.2%
<i>Potamogeton spp.</i>	Unidentified native pondweed species	31.6%
<i>Potamogeton pectinatus</i>	Sago pondweed	15.8%
<i>Potamogeton richardsonii</i>	Richardson's pondweed	1.6%
<i>Ranunculus aquatilis</i>	White water buttercup	23.7%
<i>Ruppia maritima</i>	Ditchgrass	6.8%

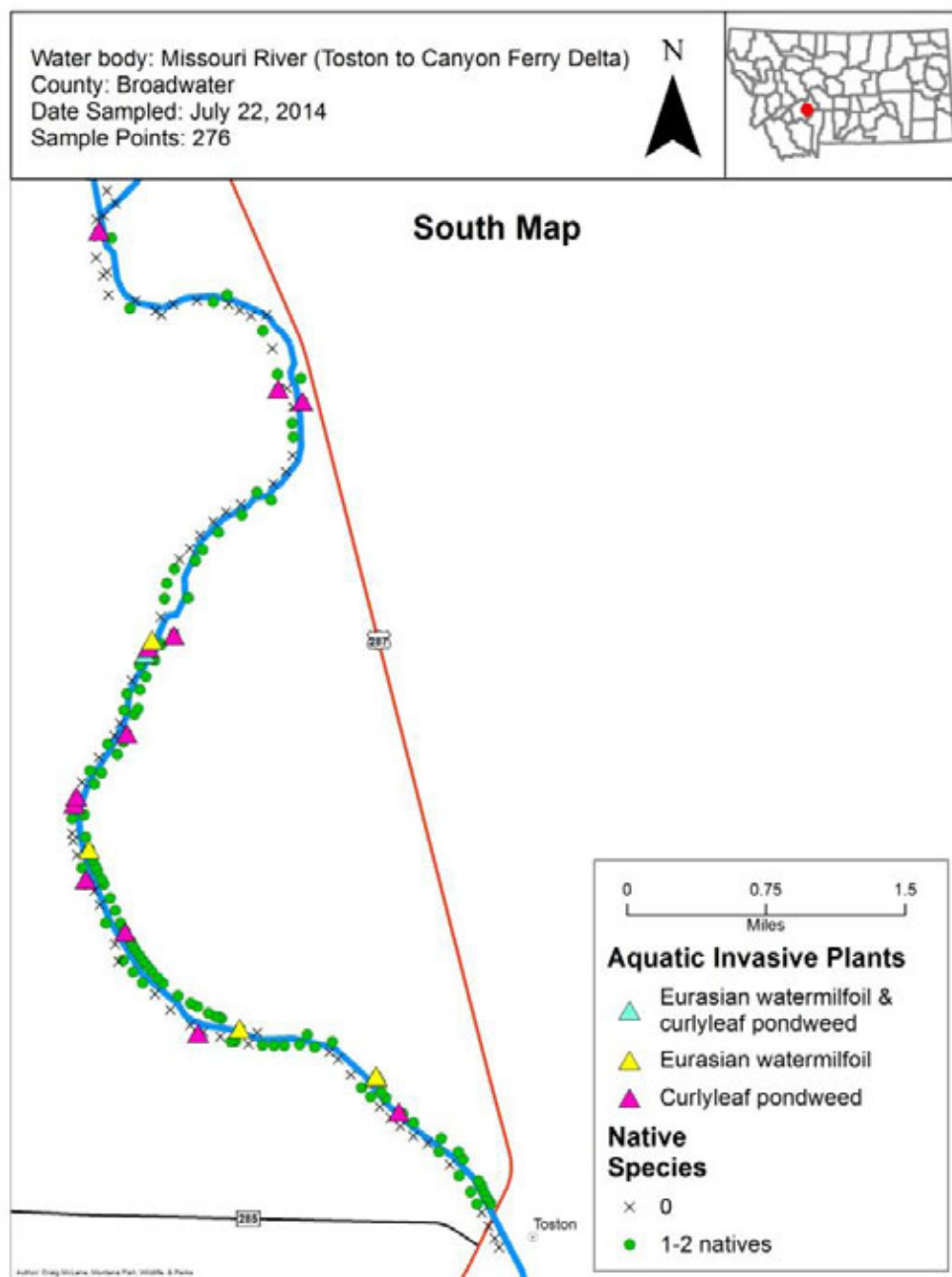


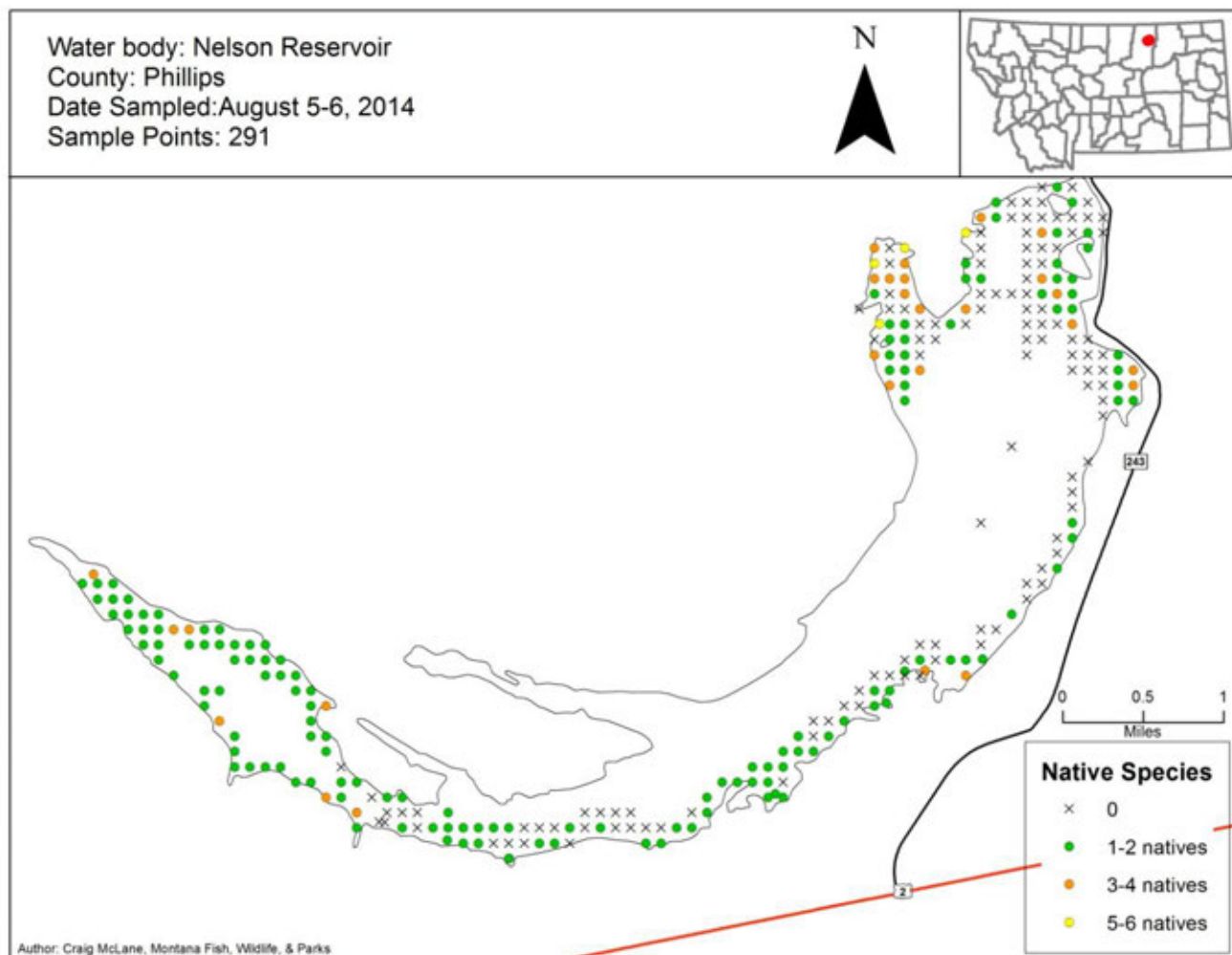
Species	Common name	Species frequency
<i>Chara spp.</i>	Muskgrass	16.4%
<i>Fontinalis antipyretica</i>	Common watermoss	2.7%
<i>Myriophyllum sibiricum</i>	Northern watermilfoil	26.0%
<i>Polygonum amphibium</i>	Water smartweed	1.4%
<i>Potamogeton alpinus</i>	Alpine pondweed	9.6%
<i>Potamogeton spp.</i>	Unidentified native pondweed species	1.4%
<i>Potamogeton natans</i>	Floating-leaved pondweed	1.4%
<i>Potamogeton pectinatus</i>	Sago pondweed	1.4%
<i>Potamogeton praelongus</i>	White-stemmed pondweed	8.2%
<i>Potamogeton richardsonii</i>	Richardson's pondweed	2.7%
<i>Potamogeton zosteriformis</i>	Flatstem pondweed	2.7%
<i>Ranunculus aquatilis</i>	White water buttercup	6.8%



Species	Common name	Species frequency
<i>Algae spp.</i>	Algae species	1.2%
<i>Chara spp.</i>	Muskgrass	52.4%
<i>Elodea spp.</i>	Waterweed species	1.2%
<i>Myriophyllum sibiricum</i>	Northern watermilfoil	7.3%
<i>Najas flexilis</i>	Slender water nymph	1.2%
<i>Nuphar polysepala</i>	Spatterdock	4.9%
<i>Potamogeton alpinus</i>	Alpine pondweed	24.4%
<i>Potamogeton spp.</i>	Unidentified native pondweed species	3.7%
<i>Potamogeton natans</i>	Floating-leaved pondweed	17.1%
<i>Potamogeton praelongus</i>	White-stemmed pondweed	6.1%
<i>Potamogeton richardsonii</i>	Richardson's pondweed	9.8%
<i>Potamogeton vaginatus</i>	Sheathing pondweed	18.3%
<i>Ranunculus aquatilis</i>	White water buttercup	7.3%

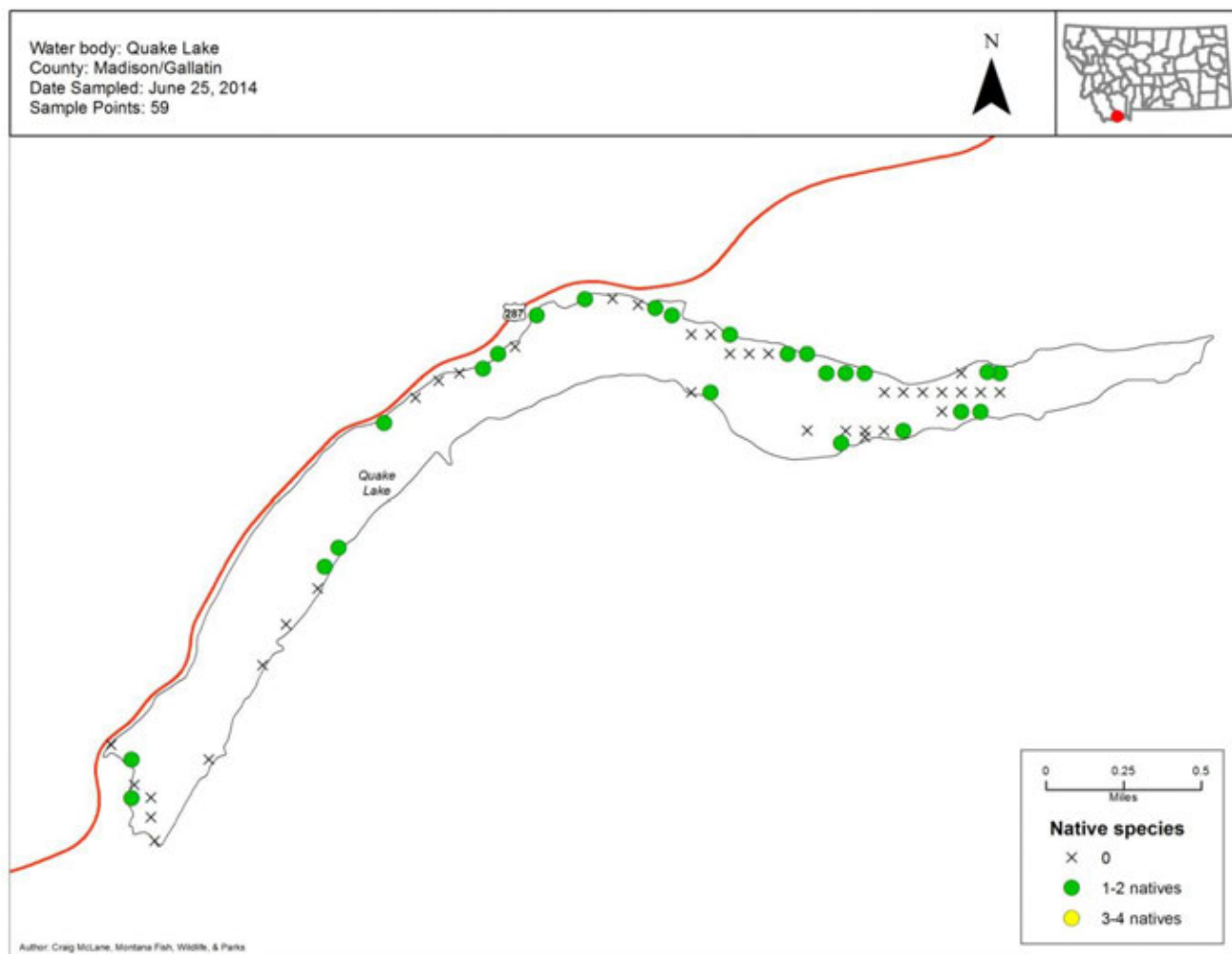




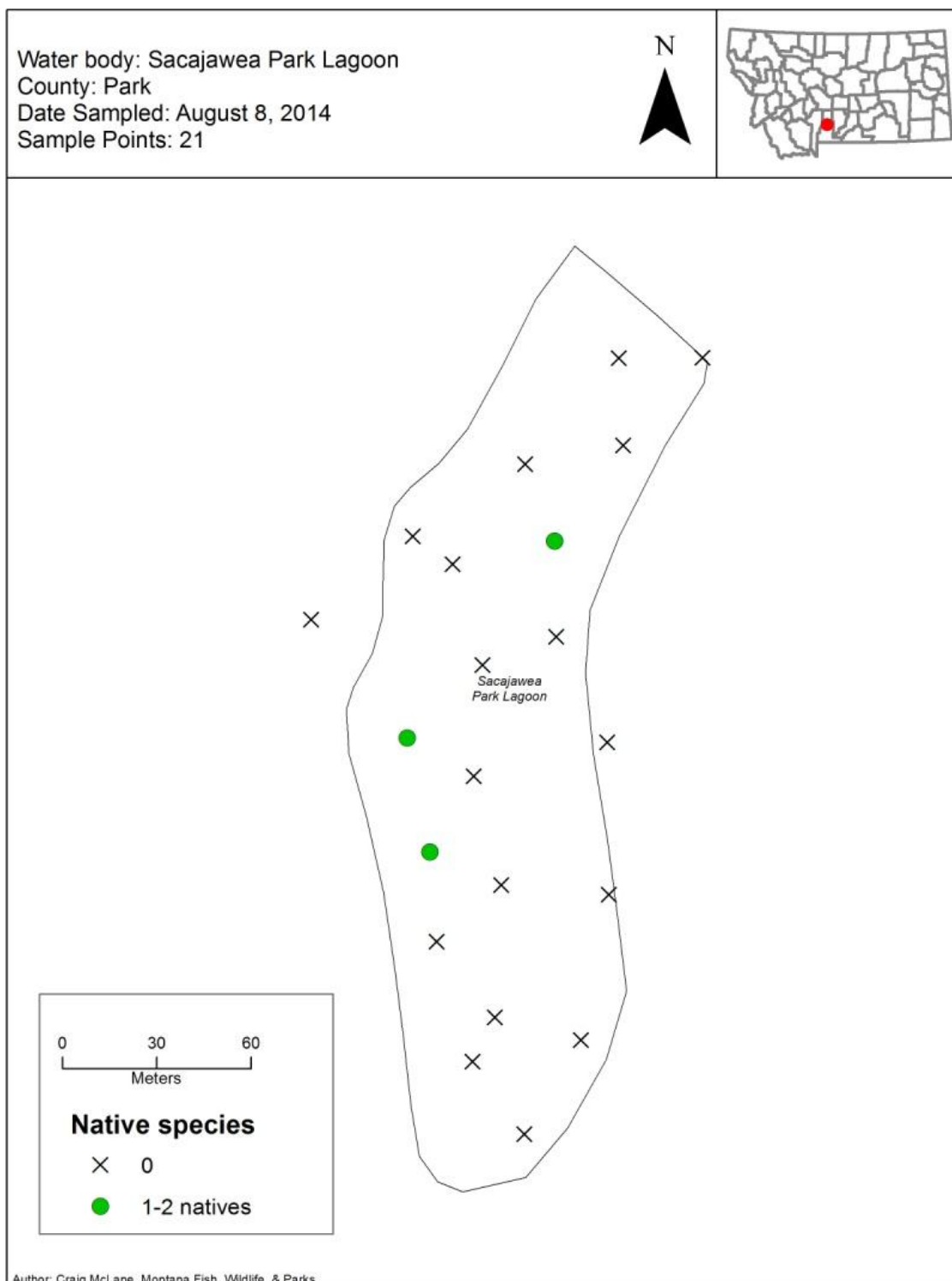


Species	Common name	Species frequency
<i>Alisma gramineum</i>	Narrowleaf water-plantain	0.3%
<i>Ceratophyllum demersum</i>	Coontail	5.1%
<i>Chara spp.</i>	Muskgrass	4.1%
<i>Elodea spp.</i>	Waterweed species	44.7%
<i>Fontinalis antipyretica</i>	Common watermoss	2.7%
<i>Myriophyllum sibiricum</i>	Northern watermilfoil	16.7%
<i>Polygonum amphibium</i>	Water smartweed	0.7%
<i>Potamogeton foliosus</i>	Leafy pondweed	17.1%
<i>Potamogeton pectinatus</i>	Sago pondweed	1.7%
<i>Potamogeton richardsonii</i>	Richardson's pondweed	0.3%
<i>Potamogeton zosteriformis</i>	Flatstem pondweed	8.9%
<i>Ranunculus aquatilis</i>	White water buttercup	0.7%

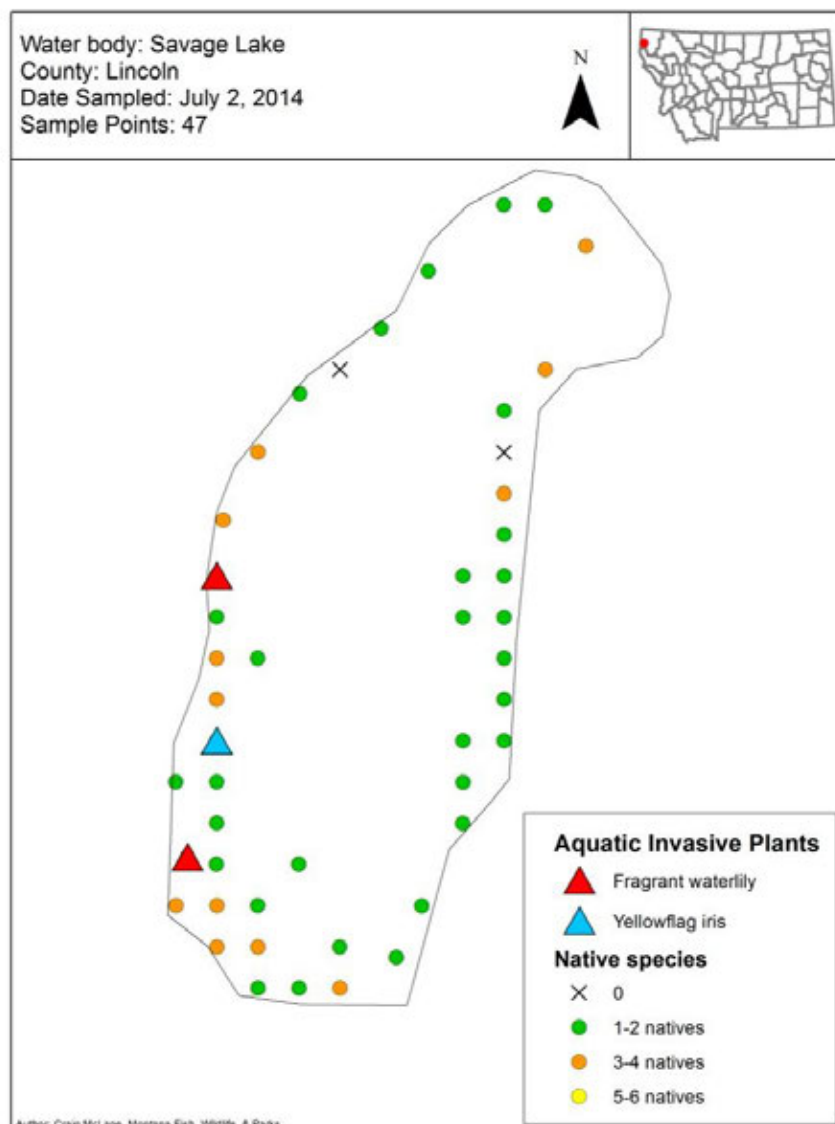
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Species	Common name	Species frequency
<i>Elodea</i> spp.	Waterweed species	20.3%
<i>Myriophyllum sibiricum</i>	Northern watermilfoil	25.4%
<i>Potamogeton richardsonii</i>	Richardson's pondweed	3.4%

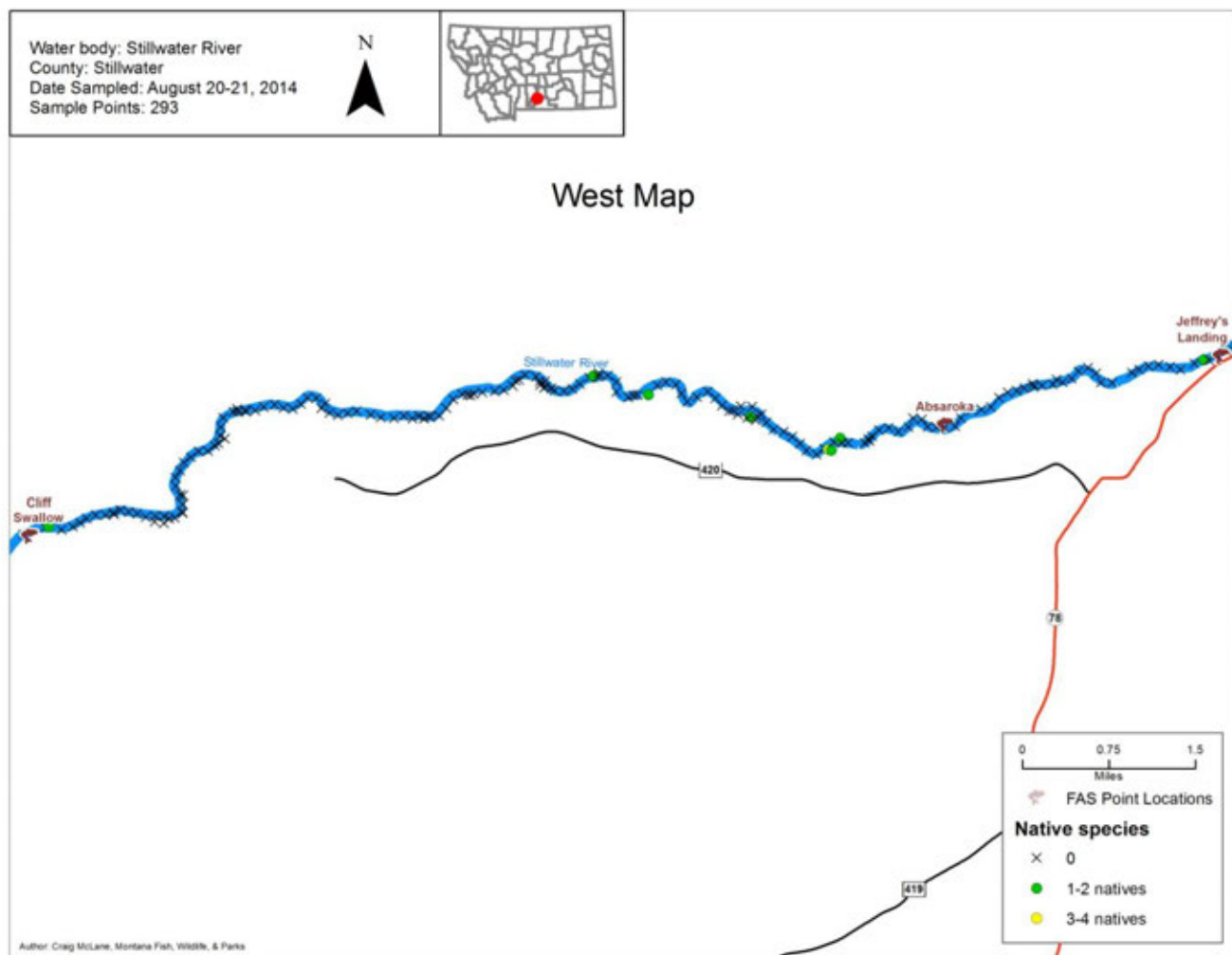


Species	Common name	Species frequency
<i>Elodea</i> spp.	Waterweed species	4.8%
<i>Polygonum amphibium</i>	Water smartweed	9.5%

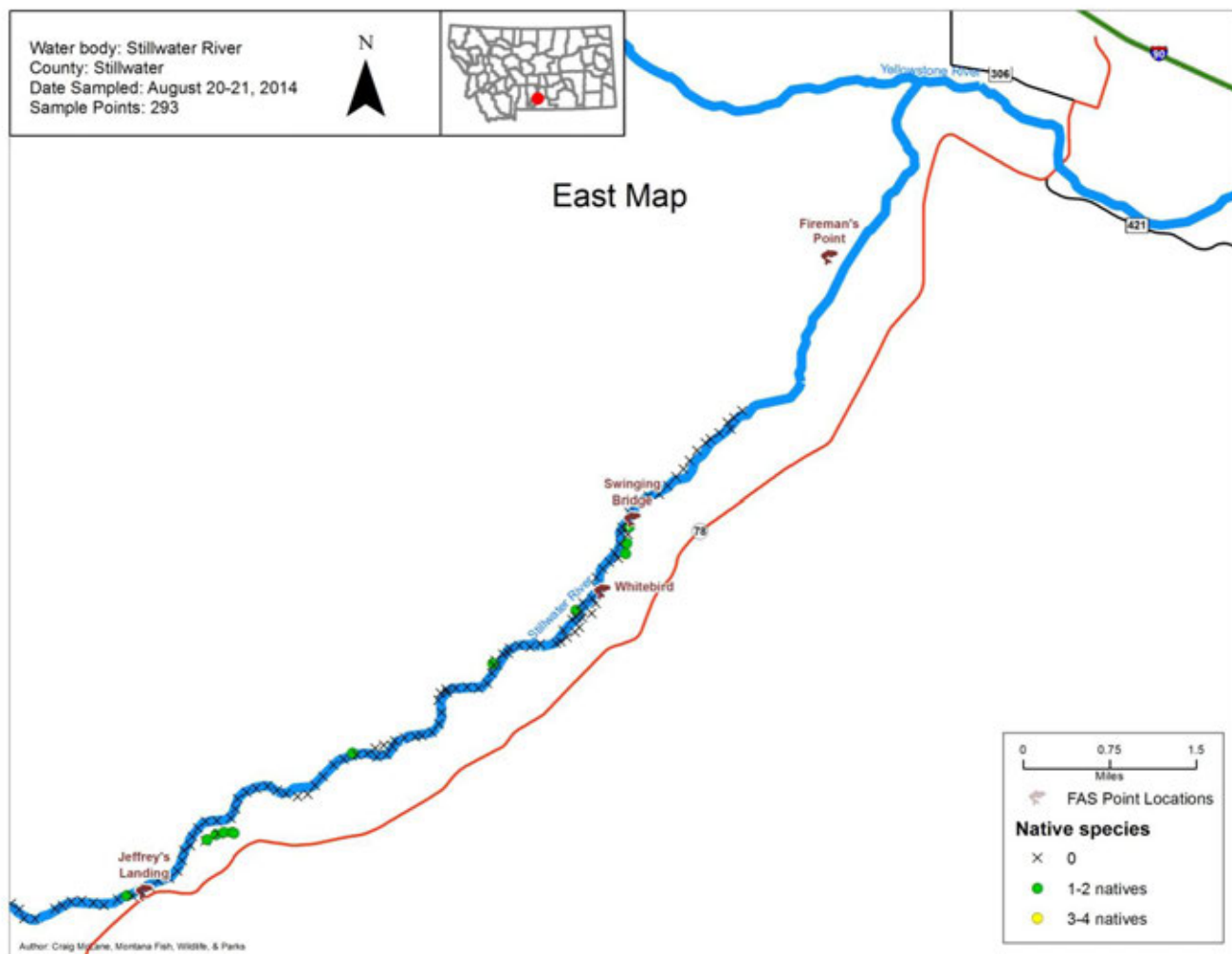


Species	Common name	Species frequency
<i>Chara</i> spp.	Muskgrass	78.7%
<i>Elodea</i> spp.	Waterweed species	2.1%
<i>Fontinalis antipyretica</i>	Common watermoss	2.1%
<i>Iris pseudacorus</i>	Yellowflag Iris	4.3%
<i>Myriophyllum sibiricum</i>	Northern watermilfoil	10.6%
<i>Najas flexilis</i>	Slender water nymph	53.2%
<i>Nuphar polysepala</i>	Spatterdock	2.1%
<i>Nymphaea odorata</i>	Fragrant waterlily	2.1%
<i>Potamogeton amplifolius</i>	Bigleaf pondweed	6.4%
<i>Potamogeton friesii</i>	Flat-stalked pondweed	6.4%
<i>Potamogeton</i> spp.	Unidentified native pondweed species	2.1%
<i>Potamogeton natans</i>	Floating-leaved pondweed	6.4%
<i>Potamogeton praelongus</i>	White-stemmed pondweed	23.4%
<i>Potamogeton richardsonii</i>	Richardson's pondweed	4.3%

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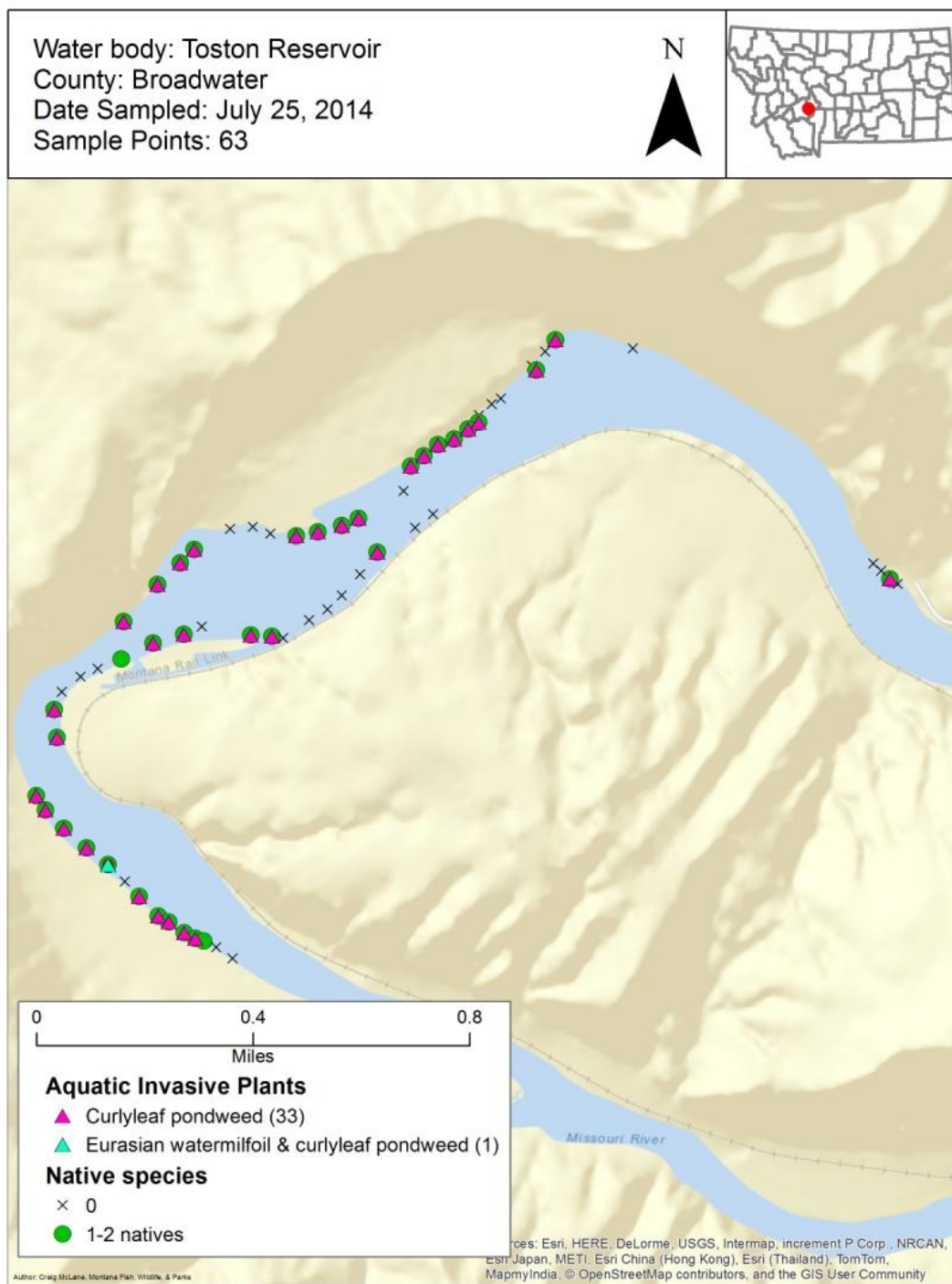


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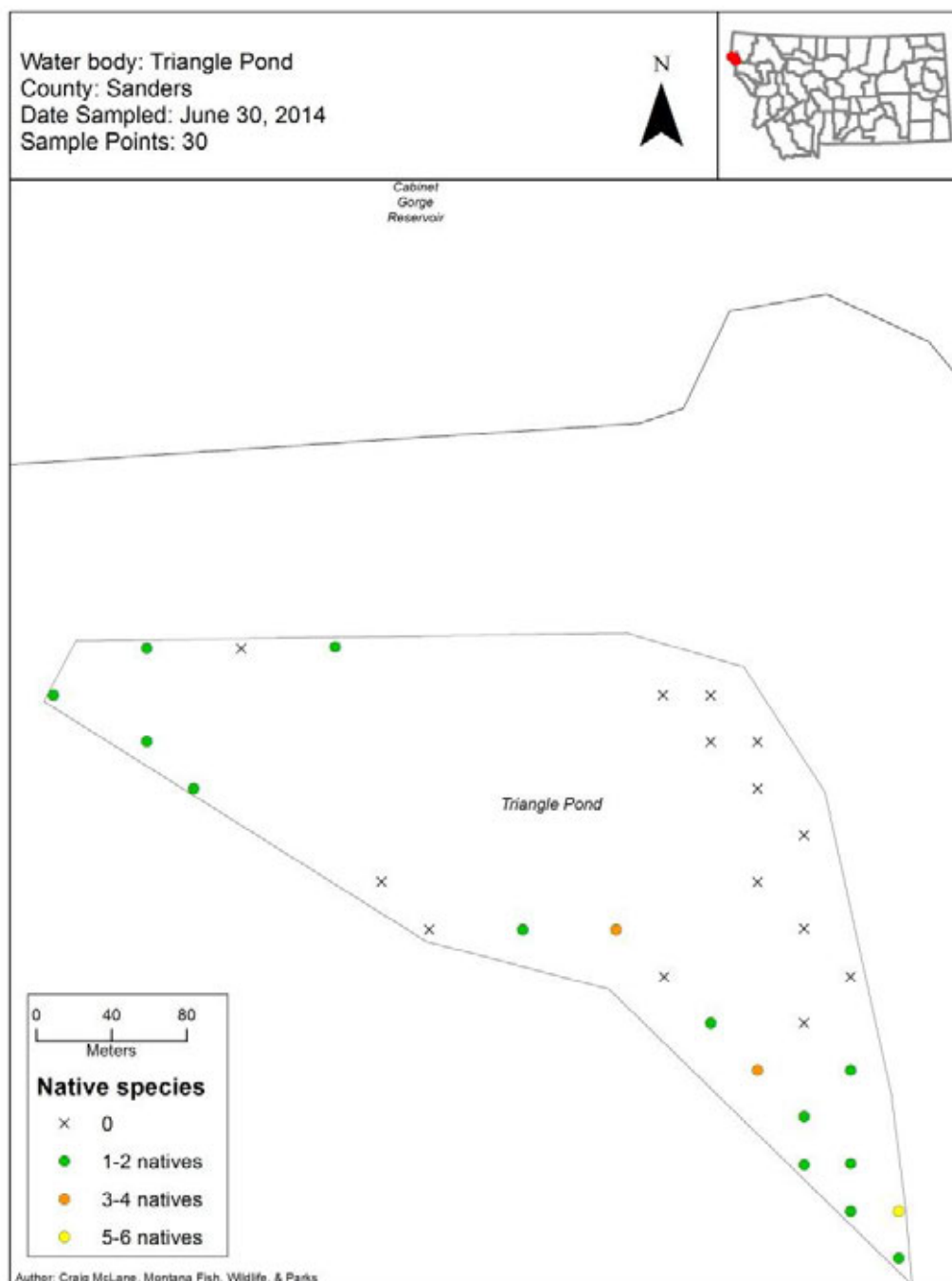


Species	Common name	Species frequency
<i>Elodea</i> spp.	Waterweed species	3.4%
<i>Fontinalis antipyretica</i>	Common watermoss	0.3%
<i>Lemna minor</i>	Lesser duckweed	0.3%
<i>Myriophyllum sibiricum</i>	Northern watermilfoil	0.3%
<i>Potamogeton</i> spp.	Unidentified native pondweed species	1.4%
<i>Ranunculus aquatilis</i>	White water buttercup	3.1%
<i>Zannichellia palustris</i>	Horned pondweed	0.3%

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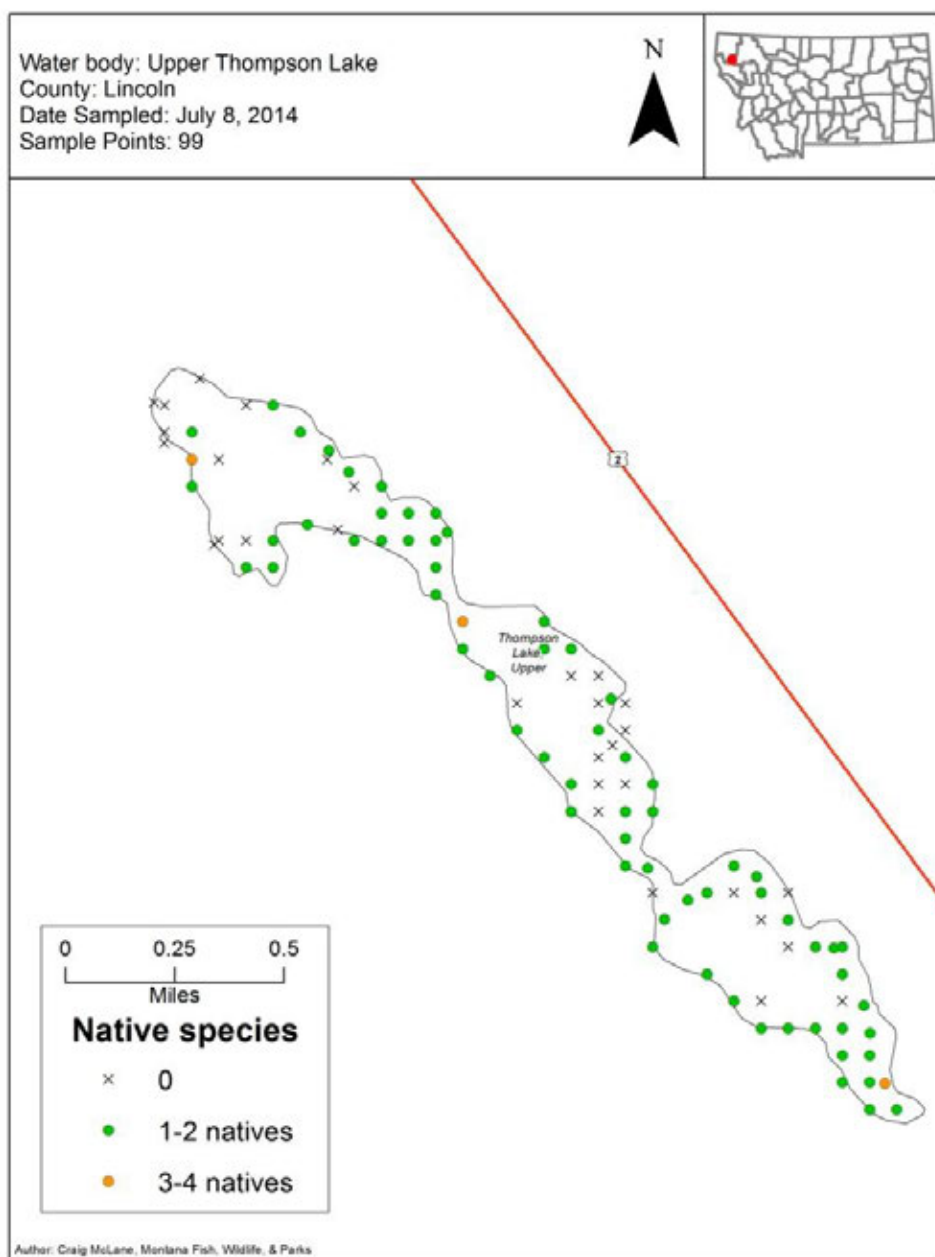


Species	Common name	Species frequency
<i>Elodea</i> spp.	Waterweed species	12.7%
<i>Myriophyllum spicatum</i>	Northern watermilfoil	1.6%
<i>Potamogeton crispus</i>	Curlyleaf pondweed	54.0%
<i>Ruppia maritima</i>	Ditchgrass	6.3%

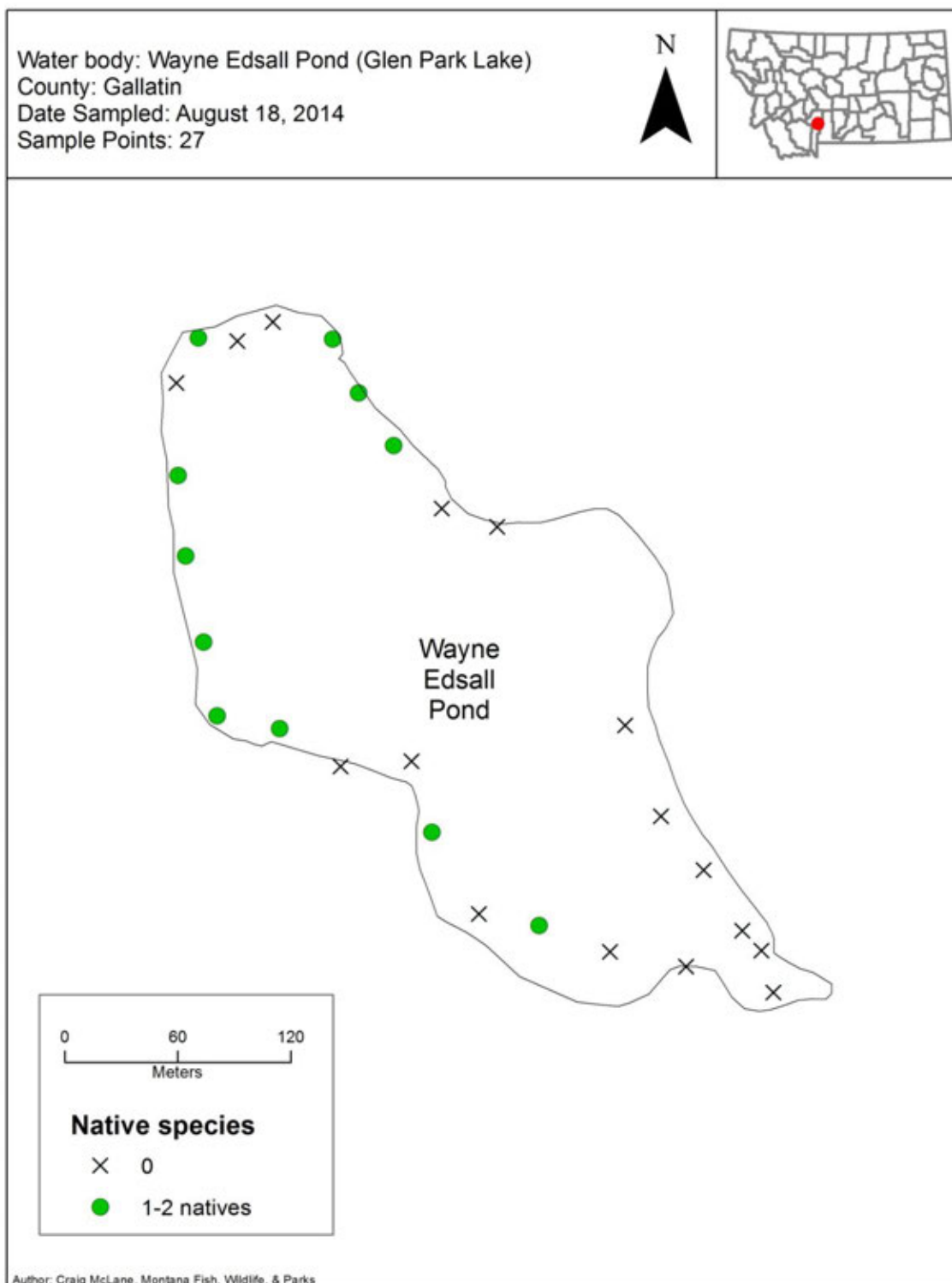


Species	Common name	Species frequency
<i>Ceratophyllum demersum</i>	Coontail	20.0%
<i>Elodea</i> spp.	Waterweed species	46.7%
<i>Myriophyllum sibiricum</i>	Northern watermilfoil	6.7%
<i>Potamogeton foliosus</i>	Leafy pondweed	3.3%
<i>Potamogeton pectinatus</i>	Sago pondweed	3.3%
<i>Potamogeton richardsonii</i>	Richardson's pondweed	3.3%
<i>Ranunculus aquatilis</i>	White water buttercup	10.0%

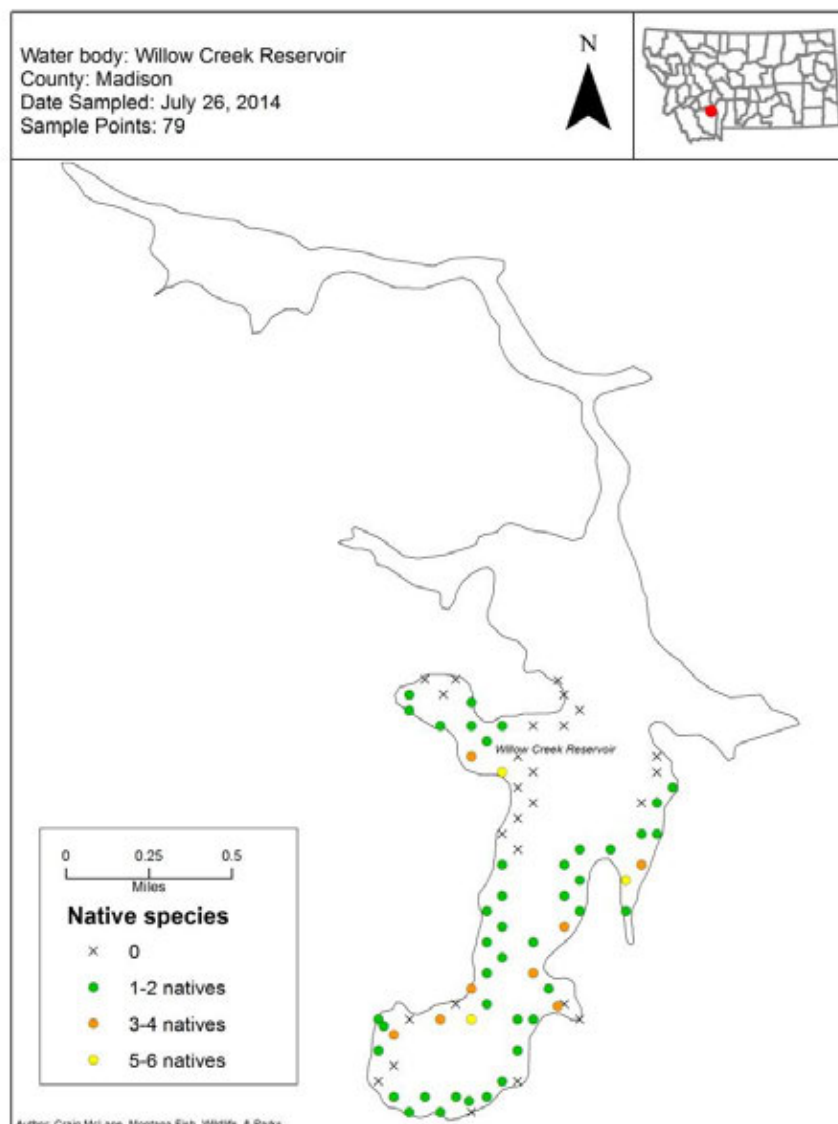
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Species	Common name	Species frequency
<i>Chara</i> spp.	Muskgrass	61.6%
<i>Elodea</i> spp.	Waterweed species	1.0%
<i>Myriophyllum sibiricum</i>	Northern watermilfoil	12.1%
<i>Nuphar polysepala</i>	Spatterdock	1.0%
<i>Potamogeton natans</i>	Floating-leaved pondweed	2.0%
<i>Potamogeton praelongus</i>	White-stemmed pondweed	2.0%
<i>Ruppia maritima</i>	Ditchgrass	2.0%



Species	Common name	Species frequency
<i>Potamogeton vaginatus</i>	Sheathing pondweed	40.7%



Species	Common name	Species frequency
<i>Chara spp.</i>	Muskgrass	11.5%
<i>Callitriche spp.</i>	Waterweed species	10.3%
<i>Elodea spp.</i>	Waterweed species	3.8%
<i>Hippuris vulgaris</i>	Mares tail	7.7%
<i>Isoetes spp.</i>	Quillwort species	2.6%
<i>Nitella spp.</i>	Nitella species	2.6%
<i>Polygonum amphibium</i>	Water smartweed	12.8%
<i>Potamogeton foliosus</i>	Leafy pondweed	5.1%
<i>Potamogeton pectinatus</i>	Sago pondweed	30.8%
<i>Potamogeton praelongus</i>	White-stemmed pondweed	1.3%
<i>Ranunculus aquatilis</i>	White water buttercup	21.8%
<i>Sagittaria cuneata</i>	Arumleaf arrowhead	2.6%
<i>Zannichellia palustris</i>	Horned pondweed	14.1%